SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

SIR WILLIAM DAWSON.

IN Sir William Dawson there has passed away the last survivor of that distinguished group of naturalists which in the earlier part of this century achieved for science in America such brilliant results and such widespread recognition—men whose range of knowledge was almost encyclopædic and many of whom made valuable contributions to science, in widely separated fields. The environment of the man of science has now changed and the older type of naturalist seems unfortunately about to disappear.

Sir John William Dawson was a native of Nova Scotia, a province which has produced more than its share of the Canadians who have risen to eminence in the various walks of life, having been born at Pictou on October 13, 1820. He died at Montreal on November 19, 1899, at the age of 79.

His father, James Dawson, was a native of Aberdeen Scotland, and came to Nova Scotia to fill a position in a leading business house in Pictou, and on the termination of his engagement began business there on his own account.

While still at school in Pictou at the age of 12 he developed a love for natural science, inherited from his father, and made large collections of fossil plants from the Nova Scotia coal measures, so well exposed about his native place. He speaks of himself at that time as being a "moderately diligent but not a specially brilliant

pupil." On leaving school he studied at Pictou College and subsequently at the University of Edinburgh. While at the former seat of learning, at the age of 16, he read before the local Natural History Society his first paper, having the somewhat ambitious title 'On the Structure and History of the Earth.' He returned to Nova Scotia in 1847 and two years later went to Halifax to give a course of lectures on Natural History subjects in connection with Dalhousie College, and organized classes for practical work in mineralogy and paleontology. These were attended by students, citizens and pupils of higher schools, a foreshadowing of university extension. In 1850, at the age of 30, having already attracted some attention by the publication of a number of papers, reports and lectures, he was appointed Superintendent of Education for Nova Scotia. From this time he became known in his native province as an indefatigable promoter of educational progress and a founder of educational institutions. His work in connection with this position obliged him to travel continually through all parts of the Province and on these journeys he accumulated that immense mass of information concerning the geology and mineral resources of Nova Scotia which are incorporated in his largest work—that entitled Acadian Geology.

Sir Charles Lyell, in 1841, on his first visit to America, met Sir William and was by him conducted to many places of geological interest in Nova Scotia, and on his subsequent visit in 1852, they together continued their studies in Nova Scotian Geology. In a letter to Leonard Horner, dated September 12th of this year, Lyell writes:

"My companion, J. W. Dawson, is continually referring to the curious botanical points respecting calamites, endogenites and other coal plants, on which light is thrown by certain specimens collected by him at Pictou. He told me that the root of the pond lily, *Nymphæa odorata* most resembled Stigmaria in the regularity of its growth, and Dr. Robb showed me a dried specimen, a rhizoma, which being of a totally different family and therefore not strictly like, still suggests the probability of the Stigmaria having grown in slush in like manner." And in another part of the same letter he, referring to the now celebrated Joggings Section on the coast of Nova Scotia, says: "Dawson and I set to work and measured foot by foot many hundred yards of the cliffs, where forests of erect trees and calamites most abound. It was hard work as the wind one day was stormy and we had to look sharp lest the rocking of living trees just ready to fall from the top of the undermined cliff should cause some of the old fossil ones to come down upon us by the run. But I never enjoyed the reading of a marvellous chapter of the big volume more. We missed a botanical aide-de-camp much when we came to the top and bottoms of calamites and all sorts of strange pranks which some of the compressed trees played."

About this time the governing body of McGill College, at Montreal, were looking about for some one fitted to assume the Principalship of the institution and to reorganize it.

The College, founded by Royal Charter in 1821, had made but slow progress in its earlier years and was at this time, through litigation and other causes, almost in a state of collapse. Sir William—then Mr. Dawson—was pointed out to the Governors of the College by Sir Edmund Head, then Governor-General, of Canada, as a man who if his services could be secured was eminently fitted to undertake the task of reconstructing the University. In the meantime, ignorant of all this, he was prosecuting a candidature for the chair of Natural History in his Alma Mater, the University

of Edinburgh, rendered vacant by the death of Professor Edward Forbes, and in which he was strongly supported by the leading geologists of the time. By a strange coincidence, just as he was about to leave Halifax for England, in connection with this candidature, intelligence arrived that the Edinburgh chair had been filled at an earlier date than his friends had anticipated, and at the same time a letter was received offering him the Principalship of McGill.

The services of Dr. Dawson were accordingly secured and in 1855 he assumed the Principalship of McGill College, stipulating at the same time that the chair of Natural History should be assigned to him. In his Inaugural Discourse he said: "At a time when literary and scientific pursuits are so widely ramified every one who aims to do anything well must have his special field of activity. Mine has been the study of nature, especially in these bygone aspects which it is the province of geology to investigate. My only other special qualification for my present position depends on the circumstance that the wants of my native province have induced me to devote much time to inquiries and pursuits relating to popular education. I come to you, therefore, as a naturalist and an educationalist, trusting that I may be enabled in these capacities to render myself useful, and asking for my youth and present inexperience in the affairs of this Institution your kind indulgence, and for the work in which I shall be engaged your zealous cooperation."

The University as he found it had three faculties and but sixteen professors, a number of whom gave only a portion of their time to university work, while the buildings and equipment were wretched. When it is stated that the University has now one hundred and twenty professors and instructors of various grades, and an equipment which is in all departments fairly good and in some of them unsurpassed, some idea may be gained of the progress which the institution made under Sir William Dawson's care and guidance.

As Professor of Natural Science, Sir William at this time delivered courses in Chemistry, Botany, Zoology and Geology. Natural Science became a very favorite study among the students, for he was an excellent lecturer, and his enthusiasm for these studies was communicated to all who heard him. As years went on the instruction in the first three of these subjects was undertaken by others, and a special chair of Geology and Paleontology was endowed by his old friend and co-worker, Sir William Logan; a chair which he held until his final retirement. His teaching work, however, formed but a small part of his daily labors. In addition to administering the affairs of the University he was first and foremost in every movement to further education in the province and no educational board was complete without him. He was the Honorary President of the Natural History Society and never missed a meeting or a field day, and also identified himself closely with many other societies in Montreal and spared neither time nor labor on their behalf.

Over and above all this he found time to carry out original work along several lines, achieving most valuable results—as well as to write many popular works on science more especially in its relation to religion. Original investigation he always considered to be one of the chief duties and pleasures of a man of science. Most of his work along these lines was done during his summer vacations, in fact he was led to accept the position of Principal in McGill, chiefly by the fact that the vacations gave him leisure and opportunity for work of this kind.

He was always very progressive in his ideas relative to the scope and development

of university teaching, and was continually urging the endowment of new chairs and the broadening of university work, so that all young men wishing to train themselves for the higher walks of life might in the university find their needs supplied. As an instance of this it may be mentioned that so far back as 1858 he succeeded in establishing a school of Civil Engineering, which after a severe struggle for five years succumbed to some unfriendly legislation, only however to be revived by him in 1871 and developed into the present Faculty of Applied Science of McGill University, with its numerous departments, its full staff of instructors and excellent equipment. Sir William, furthermore, never hesitated if funds were not forthcoming in sufficient amount for these purposes to subscribe large sums out of his own limited private means, and he was also the continual helper of needy students desiring to avail themselves of the university's teaching.

Sir William received the degree of M.A., from the University of Edinburgh, in 1856, and the degree of LL.D., from the same University in 1884. His attainments and the value of his contributions to science were widely recognized and he was elected an honorary or corresponding member of many learned societies on both sides of the Atlantic. He was made a Fellow of the Geological Society of London, in 1854 and of the Royal Society in 1862. He was the first President of the Royal Society of Canada and has occupied the same position in the Geological Society of America and in both the American and British Associations for the Advancement of Science. He was made a C. M. G., in 1883 and a Knight Bachelor in the following year.

After a long life of continuous labor, Sir William's health in 1892 became seriously impaired and it became necessary for him to lay aside his work for a time and go abroad. Failing to recover his strength, however, he resigned his position as Principal in June, 1893, and retired from active work. During the later years of his life his strength gradually ebbed away and what little work he could undertake consisted in arranging his collections and working up some unfinished papers. Several of these were published in 1894 and 1895, but the years of quiet labor in his favorite pursuits to which he looked forward at this time were cut short by a series of sharp attacks culminating in partial paralysis, which forbade further effort. During the last few years from time to time his strength rallied somewhat and he attempted to resume his work. Only a few days before his death he penned a short essay on the Gold of Ophir. He passed away on the 19th of last month, very peacefully and without pain. We may say, in the words of Dr. Peterson, his successor in the Principalship of the University. "For such a painless passing out of life no note of sorrow need be struck. There is no sting in a death like his, the grave is not his conquerer. Rather has death been swallowed up in victory—the victory of a full and complete life, marked by earnest endeavour, untiring industry, continuous devotion and self-sacrifice, together with an abiding and ever-present sense of dependence on the will of Heaven. His work was done, to quote the great Puritan's noble line, 'as ever in his great Taskmaster's eye.'"

He leaves a widow and five children, of whom the eldest, Dr. George M. Dawson, the present Director of the Geological Survey of Canada, has inherited his father's taste for geological studies and has achieved wide distinction in the world of science.

Sir William's first original contribution to science was a paper read before the Wernerian Society of Edinburgh in 1841, on a species of field mouse found in Nova Scotia. From that time onward he was a

continuous contributor to scientific journals and to the publications of various learned societies. His papers were very numerous and covered a wide range of subjects in the domain of Natural History. The most important work of his earlier years was an extended study of the geology of the eastern Maritime Provinces of the Dominion of Canada. His results are embodied in his Acadian Geology, already mentioned, a volume of nearly 1,000 pages, accompanied by a colored geological map of Nova Scotia, which has passed through four editions. In writing to Sir William in 1868, Sir Charles Lyell says of this work, "I have been reading it steadily and with increased pleasure and profit. It is so full of original observation and sound theoretical views that it must, I think, make its way and will certainly be highly prized by the more advanced scientific readers." It is the most complete account which we have of the geology of Nova Scotia, New Brunswick and Prince Edward's Island, although since it appeared large portions of these provinces have been mapped in detail by the Geological Survey of Canada and Sir William's conclusions modified in some particulars. In carrying out this work Sir William paid especial attention to the Paleontology of the Carboniferous system and to the whole question of the nature and mode of accumulation of coal. He subsequently studied the paleontology of the Devonian and Upper Silurian Systems of Canada, discovering many new and important forms of plant life. In 1884 he began the study of the Cretaceous and Tertiary fossil plants of Western Canada and published the first of a series of papers on the successive floras from the Lower Cretaceous onwards, which appeared in the Transactions of the Royal Society of Canada. He also contributed a volume entitled The Geological History of Plants to Appleton's International Scientific Series. In 1863 he published his Air Breathers of the Coal Period, in which were collected the results of many years' study in the fossil batrachians and the land animals of the coal measures of Nova Scotia. The earliest known remains of microsauria were then discovered by him in the interior of decayed tree stumps in the coal measures of South Joggings. The results of his later studies on these creatures were embodied in a series of subsequent papers which appeared from time to time.

On taking up his residence in Montreal his attention was attracted to the remarkable development of the Pleistocene deposits exposed in the vicinity of the city and he undertook a detailed study of them, and especially of the remarkably rich fossil fauna which they contain. He also studied subsequently the Pleistocene deposits of the Lower St. Lawrence and instituted comparisons between them and the present fauna of the Gulf of St. Lawrence and of the Labrador coast. The results of these studies appeared in a series of papers as the work progressed and were finally embodied in a volume entitled The Canadian Ice Age, which was issued in 1893, as one of the publications of the Peter Redpath Museum of McGill University. This is one of the most important contributions to the paleontology of the pleistocene which has hitherto appeared.

Sir William's name is also associated with the renowned Eozoon Canadense, discovered by the Geological Survey of Canada in the Grenville limestones of the Canadian Laurentian and described by him in 1864 as a gigantic foraminifer. Concerning this remarkable object there has been a widespread controversy and a great divergence of opinion. Some of the most experienced observers in the lower forms of life, such as Carpenter, accepted it as of organic origin, while others considered it to be inorganic. And while the balance of opinion now possibly favors the latter view, its resemblance

microscopically to certain organic forms is certainly most remarkable. The literature of this subject, which includes many papers by Sir William, is quite voluminous, but the chief facts are summed up in his book entitled The Dawn of Life, which appeared in 1875.

Sir William was also a prolific writer of popular works on various geological topics. Among these may be mentioned his Story of the Earth and Man, his Fossil Men and their Modern Representatives, his Meeting Place of Geology and History, and his Modern Science in Bible Lands. These books, all written in a very entertaining style, had a wide circle of readers and many of them passed through several editions.

Other volumes from his pen, as well as many papers contributed to various religious publications, treated of the relation of science and religion. One of the earliest of these was entitled Archaia, and dealt with the relations of historical geology to the Mosaic account of the Creation. In others he considered the relation of the evolutionary hypothesis to religious thought. He was always, but especially in his earlier years, a strong opponent of the Theory of Evolution and vigorously combated it. Being above all things deeply religious and considering the evolutionary explanation of the origin of the universe to be contrary to the teachings of Scripture, he refused to accept it. This was, after all, but the weakness of a strong man. It did not, however, tend to enhance his reputation among men of science, who are commonly willing to let truth work out its own results, knowing that apparent contradictions are merely indications that the whole truth has not been discovered.

These works on the relation of science and religion met a popular need and were of great comfort to many a pious soul who feared that the whole framework of faith was being swept away by the advancement of science. Their value, however, was not permanent and they are not the works by which Sir William Dawson will be remembered. His reputation is founded on the great contributions to our permanent stock of knowledge which he has made and which are embodied in his works on pure science, representing achievements of which any man might well be proud.

Sir William had a courteous, or rather a courtly manner, based on a genuine consideration for all. He was respected and beloved by all who knew him and especially endeared himself to all who studied under him. The prëeminent note of his character was simplicity and singleness of purpose. His loss will be felt especially in the institution with which he was long connected, but his name has been perpetuated in connection with the geological department of his University by the establishment of a second chair in geology, to be known as the Dawson Chair, which has just been endowed in his memory by one of the great benefactors of the University, Sir William Macdonald.

Frank D. Adams.

McGill University,
December 8, 1899.

EXTENT OF INSTRUCTION IN ANTHROPOLOGY IN EUROPE AND THE UNITED STATES.

Regularly authorized instruction in anthropology dates from the second half of the present century. Before passing the threshold of the next, it might be well to have the benefit of any inspiration which may be drawn from the progress of this new science as a branch of university discipline.

The time, the closing of a century, for such a review is, of itself, opportune. Even if it were not so, occasion would not be wanting in the independent movement in different countries looking toward the establishment of chairs and lectureships of anthro-

pology. Professor W J McGee's efforts along that line in this country are noteworthy. Professor Wilhelm Waldeyer in his inaugural address about a year ago as Rector of the University of Berlin strongly emphasized the desirability of instituting chairs of anthropology in the universities of the German Empire.*

The Anthropological Section of the British Association for the Advancement of Science at the Bristol meeting, September, 1898, appointed a Committee to ascertain "The present state of anthropological teaching in the United Kingdom and elsewhere." Professor E. B. Taylor was made Chairman of this Committee, and Mr. H. Ling Roth, Secretary. Funds were voted for carrying on the investigation. The results of this Committee's work are, no doubt, forthcoming in the report of the Dover Meeting of the British Association which was to be held in September, 1899.

The substance of this article was presented by the writer before the Anthropological Section of the American Association for the Advancement of Science, at Columbus, August, 1899, and led to the appointing of a committee to consider ways and means of furthering the instruction in anthropology in our own institutions of learning, and to report at the Christmas meeting. The committee appointed by the Chair are W J McGee of Washington, Frank Russell of Cambridge, and George Grant MacCurdy of New Haven.

To go back half a century, Professor Serres held the Chair of Anatomy at the Natural History Museum of Paris when it became the Chair of Natural History of Man, or *Anthropology*, as Serres himself called it in announcing his course.

In 1867, Paul Broca opened a laboratory of anthropology in connection with the *Société d'Anthropologie de Paris*, then already eight years old. This laboratory became part of the *École pratique des Hautes Études* the next year (1868). As early as 1870, Broca had already established a regular course of lessons which was kept up until 1876, when it was merged in the newly-founded *École d'Anthropologie de Paris*. The latter was the first and remains the only school of its kind in the world.

Across the Channel, Sir William Flower had this to say in 1881: "In not a single university or public institution throughout the three kingdoms is there any kind of systematic teaching, either of physical or of any other branch of anthropology, except so far as comparative philology may be considered as bearing upon the subject."* In 1894 Sir William Flower could still say: "A professorship of Anthropology does not exist at present in the British Isles."† Instruction in some branches of anthropology was already being given, however, both at Oxford and Cambridge.

At Oxford, E. B. Tylor was made University Professor and Reader of Anthropology, December 31, 1898. Professor Tylor is also keeper of the University Museum. As he was the first Instructor in Anthropology (since 1883) in the British Isles, so is he the first Professor and the only one. Arthur Thomson, University Professor of Human Anatomy, gives instruction in physical anthropology, and Mr. Henry Balfour, Cur. Pitt-Rivers Museum, lectures on: 'Arts of Mankind and their Evolution.'

At Cambridge, Dr. Haddon, F.R.S., and Mr. W. H. L. Duckworth have, for some time, been recognized teachers of anthropology, and a lecturer on the subject has

* Ueber Aufgaben und Stellung unserer Universitäten seit der Neugründung des deutschen Reiches. Berlin, 1898. Druck von W. Büxenstein.

* Presidential address to the Department of Anthropology, British Association, for the Advancement of Science (York meeting).

† Presidential address to the Section of Anthropology, B. A. A. S. (Oxford meeting).

just been appointed. Alexander Macalister, Professor of Human Anatomy, has, for a number of years, found time to give instruction in physical anthropology.

Sir William Turner of Edinburgh (Professor of Human Anatomy) delivers a special course of lectures, with practical demonstrations, in physical anthropology. A Museum of Anthropology was recently established at the University of Aberdeen; so that instruction in anthropology may, in all probability, be given there.

In Ireland, Dr. C. R. Browne of Trinity College, Dublin, gives demonstrations in anthropometric methods. In addition to the work done in the Anthropometric Laboratory, every year, the instruments are taken to some selected district in Ireland and a systematic study of the inhabitants is made. The Royal Irish Academy makes yearly grants to the committee in charge of this work, the character of which may be ascertained from Dr. Browne's recent report on 'The Ethnography of Clare Island and Inishturk, Co., Mayo.'*

Germany has but one professorship of anthropology — that at Munich held by Johannes Ranke. To quote Professor Wilhelm Waldeyer who speaks especially for Munich and Berlin:

"Nur in München ist ein Professor ordin. für Anthropologie angestellt; derselbe hat auch ein besonderes Institut und einen Assistenten, Hrn. *Dr. Birkner*. Sie wissen, dass *Johannes Ranke* der Professor ordin. ist.

"An den übrigen deutschen Universitäten werden zwar anthropologische Vorlesungen gehalten, aber wohl nur von Professores extraordinarii und Privat Docenten, ohne besonderen Lehrauftrag seitens der Regierung, rein als Privatsache, und es bestehen keine Institute für Anthropologie.

"Hier in Berlin lesen seit einigen Jahren:

"(1) Dr. *von Luschan*, Titular professor, über physiche Anthropologie und über Ethnologie; ferner gibt er im Völkermuseum (ganz unabhängig von der Universität), anthropologische und ethnographische Uebungskurse. (2) Professor Dr. *Wilhelm Krause*, Laboratoriumsvorstand and der anatomischen Anstalt, liest über 'Rassenkunde' und gibt Uebungen in 'anthropologischer Messungskunde.' (3) Dr. *Seler*, Geschichte und Alterthumskunde Mexico's. (4) Dr. *Huth*, Geschichte und Völkerkunde Siberiens.

"Wie es an den andern Universitäten ist, weiss ich nicht, abgesehen von dem, was ich vorhin gesagt habe."

Professor Ludwig, of Bonn, who occupies the Chair of Zoology and Comparative Anatomy, gives, in addition, a course in Physical Anthropology. Emil Schmidt (Prof. ordin. hon.) of the University of Leipzig, offers 'Anthropologie und Ethnologie' together with 'Anthropologische Uebungen.'

At Marburg i.H., P. Kretschner (Professor extraordin.) lectures on 'Indogermanische Völkerkunde und Urgeschichte Europas'; at Halle, Professor Kirchhoff, offers, among other courses, one in 'Anthropogeographie'; and at the Stuttgart Königl. Technische Hochschule, Professor Karl Benjamin Klunzinger gives instruction in anthropology and hygiene, in addition to zoology.

No French university offers a course in anthropology with the possible exception of Lyons where Ernest Chantre is Professor of Ethnology. This seems strange when we remember that the land of Buffon, Broca, de Quatrefages, and de Mortillet is looked upon as a pioneer in the anthropological sciences, and has trained a majority of all who are now teaching the subject. Channels of instruction have been found other than the universities—namely, the *École libre d'Anthropologie de Paris* and the *Museum d'Histoire Naturelle* at the *Jardin des Plantes*.

* Proc. Roy. Irish Acad. 3d ser., Vol. V., No. 1, Dec., 1898.

The École d'Anthropologie offers nine courses by as many professors. They are as follows:

Matthias Duval; *Anthropogénie, Embryologie.*

André Lefèvre; *Ethnographie et Linguistique.*

Letourneau; *Sociologie*

Hervé; *Ethnologie.*

Manouvrier; *Anthropologie physiologique.*

Capitan; *Anthropologie préhistorique.*

Laborde; *Anthropoligie biologique.*

Mahoudeau; *Anthropologie zoologique.*

Schrader; *Géographie anthropologique.*

A monthly *Revue* is published by the professors. The Laboratory of Anthropology which forms a part of the system called *École pratique des Hautes Études en Sorbonne* very naturally finds a home at the *École d'Anthropologie.*

The Chair of Anthropology at the *Museum d'Hist. Naturelle* is occupied by Prof. Hamy. His colleague is Dr. Verneau, who also offers courses in anthropology at the *École Coloniale* and the *Hôtel de Ville.*

The Universities of Italy make a good showing. Giuseppe Sergi is Professor of Anthropology at Rome, and Director of the Anthropological Cabinet, and Giustiniano Nicolucci fills a similar position at Naples, where Drs. Penta and Zuccarelli are Docents for Criminal Anthropology. The *Regio Istituto di Studi Superiori Pratici e di Perfezionamento*, Florence, has the distinction of a professor of anthropology in *Paolo Mantegazza.* In three other Italian Universities, the subject is receiving attention. Professor Severi is the authorized Docent for Legal Anthropology at Genoa; Professor Lombroso, for Criminal Anthropology at Turin; and Tito Vignolo for Anthropology and Comparative Psychology at Milan.

Spain and Portugal have, each, one chair of anthropology—at Madrid and Coimbra, respectively. At Madrid, Manuel Antón y Ferrándiz is Professor *Cathedratico* of Anthropology and the Natural History of Man; at Coimbra, Bernardino Luis Machado Guimarães is Professor *Cathedratico* of Anthropology and Paleontology.

Dr. Rudolph Martin, sometime instructor in Anthropology at the University of Zurich, Switzerland, has just been promoted to an assistant professorship, Dr. Martin is also Docent for Anthropology in the Polytechnic School of Zurich.

Hungarian, German and Bohemian Universities all are contributors to anthropology in the Empire of Austria-Hungary:

Aurel Török, Professor ordin., Anthropology and Ethnology, and Director of the Anthropological Museum, Budapest; Lubor Niederle, Professor ordin., Anthropology and Prehistoric Archæology, Prague; and Moriz Hoernes, Professor extraordin., Prehistoric Archæology, Vienna. At the latter University, Dr. Michael Haberlandt is Docent in General Ethnography, and Dr. Phillip Paulitschke's lectures are ethnographical although his title is Docent in Geography.

A chair of geography and anthropology was recently created at the Imperial Academy of Sciences, St. Petersburg; D. N. Anutchin is the occupant. At the University, E. J. Petdri is Professor of Geography and Ethnography and Director of the University Geographical Anthropological Cabinet.

In Moscow, D. N. Anutchin is Professor of Geography and Ethnography and Director of the University Anthropological Museum; and Dr. N. N. Charuzin is Docent for Ethnography.

In Holland, there is no professorship of anthropology, so far as appears. J. J. M. de Groot is Professor of Ethnography at Leyden; Dr. G. J. Steinmetz is Instructor in Ethnology at Utrecht; and Professor G. Jelgersma of Amsterdam lectures on Criminal Anthropology.

Monsieur E. Houzé is Professor of Anthropology at the *Université libre de Bruxelles*, Belgium. The course given by Professor Houzé was inaugurated in 1884. At the new University, Brussels, Professor G. Delbastee gives lectures on Criminal Anthropology.

For Scandinavia, there is a chair of northern archæology at the University of Christiania occupied by Professor O. Rygh. In the same Faculty, Yngvar Nielsen is Professor of Geography and Ethnography and Director of the University Museum of Ethnography.

The University of Athens possesses an anthropological museum; Dr. K. Stephanos, the Curator, may possibly give some instruction in the subject.

Mention has already been made of the movement in the United States to give anthropology more general recognition as a branch of university discipline. It has already taken its place in the curriculum of a number of our leading institutions.

In the Peabody Museum of American Archæology and Ethnology at Cambridge, Harvard University has a most suitable habitation for a department of anthropology—extensive collections, laboratories, special library, lecture rooms, all combined under one roof and management, with its own special faculty, endowments, fellowships and scholarships. Frederick Ward Putnam, Curator of the Museum and Professor of American Archæology and Ethnology; Dr. Frank Russell, Instructor in Anthropology; and Roland B. Dixon, Assistant in Anthropology, offer a number of courses, both general and special. An anthropological club holding semi-monthly meetings testifies to the lively interest in the subject at Harvard.

Only a few months ago a professorship of anthropology was created in Columbia University, New York, and Dr. Franz Boas, for several years Lecturer in Anthropology, was promoted to the Chair. The work of Professor Boas is done in part at the American Museum of Natural History and in part at the Psychological Laboratory of the University, where Dr. Livingston Farrand (Instructor in Psychology) gives courses in ethnology, one of them being half of a general introductory course in anthropology by Drs. Boas and Farrand.

At the University of Chicago, there is a provisional union of sociology and anthropology in a single department. "The differentiation of an independent department of anthropology and ethnology is anticipated." Dr. Frederick Starr is Associate Professor of Anthropology and Curator of the Anthropological Section of Walker Museum.

At New Haven, Yale University has for several years had the benefit of a course in general anthropology based on Ranke's 'Der Mensch.' For this course we are indebted to William G. Sumner, Professor of Political and Social Science. Professor Sumner's generous impulses and admirable fitness, equal to his sense of the University's need, has led him to assume, willingly, extra labor and responsibility. To such men, many a university has been indebted for the growth and present richness of its curriculum, and, many a new science, for its separate and vital existence.

Dr. E. Hershey Sneath, Professor of Philosophy, gives a course entitled 'Philosophical Anthropology,' based on Lotze's Microcosmus.

The appointment of George Grant MacCurdy as Instructor in Prehistoric Anthropology at Yale dates from May, 1898. His courses are given at the University Museum, where a Laboratory of Physical Anthropology is being established, and where anthropological collections are being arranged both for students and for the public.

At Clark University, Worcester, A. F. Chamberlain is Lecturer in Anthropology. Assistant Professor W. Z. Ripley (Sociology

and Economics, Massachusetts Institute of Technology, Boston) gives a 'course of one term' in Anthropology at the Institute yearly; and at Columbia University (New York) in the School of Political Science, a course of one term entitled now Racial Demography, being a study of the population anthropologically of Europe and the United States. It was formerly called anthropology, but the title has been changed this year as given.

At the National Capital, some of the universities are making use of the anthropologists connected with the United States National Museum. Thomas Wilson, curator of the Division of Prehistoric Anthropology, lectures at the National University, and Otis T. Mason is lecturer in Anthropology at the Columbian University.

M. M. Curtis, professor of philosophy, Western Reserve University, Cleveland, gives a course of lectures on the history and the main problems and bearings of anthropology, and A. S. Packard, professor of Zoology and Geology, performs a like service for Brown University, Providence. During the month of March, 1899, Professor W J McGee, Ethnologist in charge of the Bureau of American Ethnology, Washington, D. C., gave, at the State University of Iowa, a course of eleven lectures in general anthropology to large audiences. Such a beginning augurs well for the future growth and development of a recognized branch of instruction.

Instruction in anthropology at the Ohio State University may be said to have a beginning in the work being done by Mr. W. C. Mills, Curator of the Ohio Archæological-Historical Society.

In the death of Professor Daniel G. Brinton, both the University of Pennsylvania and the Philadelphia Academy of Natural Sciences have lost a valued teacher of the anthropological sciences. No one has yet been appointed to take his place.

In order to reduce the above information concerning extent of instruction in anthropology to a more compact form, use is made of the following table.

Of the forty-eight institutions in the thirteen countries giving a place to anthropology in their curricula, eleven are located in the United States; and of the total teaching force of seventy-four, our own country is credited with seventeen. But in the matter

COUNTRIES.	Institutions.	Professors.	Assistant Professors.	Instructors.	Total teaching force.	FACULTIES.
British Isles.	4	1	0	8	9	Natural Science.
Germany.	7	1	2	8	11	Philosophical.
France.	4	11	0	1	12	Philosophical or Faculté de Lettres.
Italy.	6	3	0	5	8	Philosophical; Nat. Sci.; Med.
Spain.	1	1	0	0	1	Science.
Portugal.	1	1	0	0	1	Philosophical.
Switzerland.	2	0	1	1	1	Natural Science.
Austria-Hungary.	3	2	1	1	4	Philosophical.
Russia.	3	1	0	3	3	Natural Science.
Holland.	3	0	0	3	3	Various.
Belgium.	2	1	0	1	2	Medical.
Scandinavia.	1	0	0	2	2	Philosophical.
United States.	11	1	1	15	17	Various.
	48	23	5	48	74	

of professorships, the United States suffers by comparison, being allowed only one out of twenty-three by the strict terms of the title—that at Columbia held by Dr. Boas.

The above table is intended to serve more as a comparison of figures than of forces. To know precisely what is being done for the science in the several countries, one would have to take account of anthropological publications, museums, societies and clubs, as well as of sections of general scientific associations and academies of sciences. Such a compilation is beyond the scope of the present article.

So much for the extent * of instruction in anthropology as the century closes. The importance of the subject as a branch of university discipline, its terminology and the faculty to which it should belong, have all been touched upon by such authorities as Daniel G. Brinton † of Philadelphia, Friedrich Müller ‡ of Vienna, Rudolph Martin § of Zurich, and Geo. A. Dorsey || of Chicago.

Professor Brinton made a "brief presentation of the claims of anthropology for a recognized place in institutions of the higher education in the United States" and asked for "the creation in the United States of the opportunity of studying this highest of the sciences in a manner befitting its importance." His classification and nomenclature, and his general scheme for instruction in this science acted as a stimulus to discussion on two continents.

Brinton's principal subdivisions are:

I. Somatology—Physical and Experimental Anthropology.

II. Ethnology—Historic and Analytic Anthropology.

III. Ethnography—Geographic and Descriptive Anthropology.

IV. Archæology—Prehistoric and Reconstructive Anthropology.

Professor Müller does not see the need of separating the Geographical Ethnos from the Historic Ethnos, and, therefore, makes three divisions with a professorship for each:

I. Physical Anthropology.

II. Ethnography and Ethnology.

III. Prehistoric Anthropology. The first he would place with the medical faculty, the other two, with the so-called philosophical faculty of the German universities. When the three professors cannot be had—an anatomist for somatology, an ethnologist and linguist for ethnology and ethnography, and a geologist and archæologist for the prehistoric—then Müller would suggest a double division: (1) Physical and Prehistoric Anthropology and (2) Ethnology and Linguistics. This, however, would divide the professorship of Physical and Prehistoric anthropology between two faculties, giving half to the medical faculty and half to the philosophical.

Professor Martin, on the other hand, argues that "die ganze Anthropologie in der naturwissenschaftlichen Abteilung der philosophischen Fakultät ihren natürlichen Platz hat." This seems to be the more logical arrangement and the one adopted practically by every university professing to give instruction in the subject as shown in the table above.

* Corrections of and additions to the record are respectfully solicited. The writer is especially indebted to Monsieur le Ministre de l'Instruction publique et des Beaux-Arts, France; and Professors Wilhelm Waldeyer, Rector of the University of Berlin; Alexander Macalister, Cambridge, England; E. Houzé, Brussels; Moriz Hoernes, Vienna; W J McGee, Washington, D. C.; W. Z. Ripley, Boston; the Hon. W. T. Harris, U. S. Commissioner of Education; and his Excellency the Royal Prussian Kultusminister.

† Anthropology as a Science and as a Branch of University Education, Phila., 1892.

‡ Die Vertretung der anthropologisch-ethnologischen Wissenschaften an unsern Universitäten, Globus, Bd. 66, S. 245, 1894.

§ Zur Frage von der Vertretung der Anthropologie an unsern Universitäten Globus, Bd. 66, S. 304, 1894.

|| The Study of Anthropology in American Colleges. Archæologist, Dec., 1894, Waterloo, Indiana.

The difficulties of placing anthropology with this faculty or that are themselves evidence of the fundamental character of the science. A branch of instruction that may be claimed by different faculties, and, at the same time, not adequately represented in any, might justly claim title to a faculty of its own.

Anthropology has matured late; has been waiting for the contributions other sciences in the course of their development were bound to make to her; waiting till the prehistoric perspective came to supplement the historic, permitting man to take the same dispassionate view of self as of the rest of nature, till remote lands told their story of human variation and culture stages, and till the teachings of embryology and comparative anatomy were better understood. The development and succession of the sciences may be likened to the development and succession of the fauna of which man forms a part. As man is last and highest in the geological succession, so the science of man is the last and highest branch of human knowledge. It is to be hoped that the overflow from the sciences contributing to anthropology may be properly conserved and so distributed as to find its way more generally to the channels of university instruction. Whether the channel chosen be an existing faculty or a new and separate one is not so important as the stream it has to carry; and there is reason that to believe that stream is gaining in volume constantly.

After the foregoing article was in type, there came from his Excellency the Royal Prussian *Kultusminister*, in answer to my request of May 16th last for information, a manuscript statement handed in to him, September 27, 1899, by Professor Wilhelm Waldeyer entitled "Bericht über das anthropologishe Unterrichtswesen in Deutschland." From this the writer is able to supplement his own lists for Germany as follows:

Breslau, Dr. Partsch (Prof. ordin., Geography), 'Völkerkunde Europas'; Göttingen, Dr. von Bürger (Prof. tit., Zoology), 'Ursprung und Vorzeit des Menschen'; Heidelberg, Dr. H. Klaatsch (Prof. extraord., Anatomy), 'Anthropologie'; Kiel, Dr. Krümmel (Prof. ordin., Geography), 'Ausgewählte Kapitel der Anthropo-geographie'; Königsberg, Dr. Bezzenberger (Prof. ordin., Comp. Philology), 'Urgeschichte Ostpreussens'; Strassburg, Dr. G. Schwalbe (Prof. ordin., Anatomy), 'Anthropologie'; Tübingen, Dr. von Sigwart (Prof. ordin., Philosophy), 'Philosophical Anthropology.'

This increases the number of German universities giving instruction in anthropology by seven, but does not augment the number of professorships.

Dr. W. H. L. Duckworth is the newly appointed University lecturer in physical anthropology at Cambridge.

GEORGE GRANT MACCURDY.

YALE UNIVERSITY,
NEW HAVEN.

ECONOMICS, POLITICS AND FINANCE OF VOTING MACHINES.

THE writer, as a member, from its organization, of the New York State Commission to inspect and authorize voting machines for the use of the cities and towns of the state, and as Chairman for some years, to date, of the Finance Committee of the City Council of Ithaca, has had occasion to study the very novel and most ingenious construction of voting machines and to seek to ascertain their value in economics and politics, and as a matter of finance; and it is possible that economists and students of politics and of finance may find the deductions from this exceptionally fortunate experience both interesting and important—interesting as a curious illustration of the

inventive genius of our people and as an irruption of that genius into an unexpected line of work, important in its bearings upon good politics and on economics, through a better insurance of the expression of the real judgment and intent of the people, as given at the polls.

The 'voting machine' is an apparatus consisting of a very simple arrangement of a very simple form of mechanical counter, in groups, in such manner that, when the voter moves a handle or presses a button over a certain name, opposite the designation of a certain office, on the front of the machine, the act moves that individual counter one notch, and one is added to the reading on that particular count. It is also so arranged that, if the voter desires to vote a whole, '*a straight*' ticket, the pulling down of a handle, or the pressing of a button at the limit of the line of names of candidates, moves the counters of every individual candidate on that ticket and one motion counts a party-vote. Further, it is, in all approved voting machines, possible to vote any 'split ticket' and it is made a matter of fundamental construction that no voter shall be able to vote more than once for any candidate or for any party. In other words: the machine is constructed so that each voter shall, by the simple acts described, be able to vote, within the law, precisely as he may choose, while it is impossible for him to do anything which the law forbids. He has absolute freedom to do right; he cannot possibly do a legal wrong. The ingenuity and simplicity of these machines and the positive certainty of their operation as desired within legal limits make them, as a class, extraordinarily interesting studies in mechanism.

In New York, as in, now, quite a number of other states, there are provisions of law permitting and regulating the use of these machines and they have now had so extended and so extensive a trial that it is possible to speak positively of them as, where of approval construction, an entire and singular success. In New York, no voting machine can be employed until it has been fully inspected, carefully studied and unqualifiedly approved, by the Voting Machine Commission; from whom a report must be secured, and filed in the office of the Secretary of State, to the effect that the machine is capable of registering six hundred voters in the election hours, accurately and efficiently, can be safely employed for that purpose, and that the Legislature of the State is justified in legalizing its use. Under these provisions of law, the cities of Buffalo, Rochester, Utica, Ithaca and other smaller places, have now used the machines in regular elections. In one or two places, older forms of machine, introduced before the commission for their inspection and endorsement was formed, have not proved satisfactory; but the later experiments have been entirely so, and Buffalo has 108, Rochester 73, and other places lesser numbers, all of which are reported to have proved a marvellous success.

One of these machines costs $500, registers a maximum, under the law—there is no limit in construction—600 voters, at the rate of 5 to 15 seconds each voter, saves $16 a year in cost of operating a precinct, $40 to $50 in election printing, and, by enabling a reduction to be made in the number of election precincts, saves about $200 on each one abolished. In Ithaca, the reduction, if the law is followed precisely, will be not less than two nor more than four districts, out of ten; saving the city from twenty to forty per cent. *net* on the investment. The following were the conclusions reported by the Finance Committee to the City Council and the people of Ithaca:

"Summarizing our conclusions your Finance Committee would respectfully submit that

"(1) The voting machine is a simple, reliable, durable and convenient apparatus for its purpose.

"(2) The machine compels the deposit of a perfect and accurate ballot, of the form chosen by the voter.

"(3) It restric's the voter absolutely to the limits of the law and permits him freedom as absolute in voting within that limit.

"(4) Blank and defective ballots, the usual fault of ordinary methods of voting, are entirely done away with and no man loses his vote through defect of the system, or fault of his own, if he votes at all. The disfranchised voter becomes unknown.

"(5) Fraudulent voting is impossible as well as errors in voting.

"(6) The vote cast is registered, vote by vote, with absolute accuracy and certainty.

"(7) The result can be declared immediately upon the close of the polls, having been already completely counted.

"(8) The cost of the system is so much less than that of the old method that the machines usually pay for themselves in from three to seven years.

"The whole case may be summarized in a sentence: 'The machines retain all the virtues and exclude all the vices of the old methods of balloting.' Their use would be entirely justified, even though they involve a more costly, rather than a much less expensive system. Their adoption is looked upon by your committee as promoting good politics, good morals and good finance."

The possible ultimate result of the general introduction of these new methods of election upon the freedom of the ballot and the honesty and accuracy of the count, and upon the future politics and economics of the state and nation, no one can probably quite realize or predict; but that this insurance of a full vote and an honest one will tell for good government, and the purification of parties and their methods, no one can doubt. As the representative of the Patent Office said, in his testimony before the Committee of Congress regarding the proposed, and later-enacted, measure legalizing the voting machine in federal elections we cannot doubt that "It is the last and best contribution to the science of good government."

Judge Cooley said that, in his opinion such a method is a 'constitutional right' of every voter. The most surprising fact is, perhaps, that in the case above referred to, there was but one protest, in the city of Ithaca, out of over 2500 voters. Every inspector of election signed a certificate to the effect that the experiment was absolutely satisfactory, and the only objections heard were from one 'party-leader,' and the only adverse interests discovered were those affected by the abolition of ballot-printing, which is a much larger item of cost—at political prices—than is usually supposed. Each printed ballot costs from four to twenty cents, at the various elections, municipal, state and general.

R. H. THURSTON.

ITHACA, December, 1899.

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*A COMPLETE MOSASAUR SKELETON, OSSEOUS AND CARTILAGINOUS.**

IN the spring of 1898, Professor S. W. Williston's fine memoir upon the Kansas Mosasaurs seemed to cover the subject completely, summing up all the facts derived from the great Kansas University collection, as well as many of the results of the labors of Cuvier, Owen, Marsh, Cope, Dollo, Baur, and others. But it appears impossible to say the last word in paleontology. Professor Williston himself has recently described a portion of the nuchal fringe of *Platecarpus*, as well as the epidermal fin contours. The remarkable specimen which has recently been mounted in the Marine Reptile Corridor of the American Museum throws new and welcome light not only upon *Tylosaurus*, but upon the anatomy of the Mosasaurs in general.

Together with the practically complete bony skeleton, are seen cartilages of the throat and chest, portions of the larynx, trachea, bronchi, the epicoracoids, as well as the suprascapulæ, the sternum and sternal ribs. Originally these parts were preserved entire, and we must deeply re-

* Extract from Memoirs of the American Museum of Natural History, Vol. I., Part IV.

gret that before this specimen came into possession of the Museum, much damage was done to the relatively inconspicuous cartilages, in course of removal of the bones. Nevertheless Mr. Bourne, of Scott City, Kansas, who excavated the fossil, deserves great credit for the skill and care with which the conspicuous parts were removed.

The specimen reached the Museum in a series of large slabs of Kansas chalk and was worked out in such a manner that all the contours of the original slabs are preserved and fitted together by their edges, as in the original bedding; therefore the great lizard with all its parts, excepting a few minor pieces, lies exactly as it was imbedded. The original matrix surrounds practically all the bones, and can be distinguished from the buff-colored outlying plaster, by its somewhat darker shades. The whole is mounted upon a panel twenty-five feet long and permanently placed in a corridor which is to be devoted to marine reptiles.

The animal lies outstretched upon its ventral surface, so that all the bones are exposed upon the dorsal or lateral surfaces, excepting the left humerus and ulna, which are overturned. The skull is crushed to the left, together with the vertebræ, as far back as the 6th dorsal. From the 7th to the 10th dorsals the vertebræ are confused and displaced. The 11th dorsal to 29th caudal are horizontal with the transverse processes outspread and the spines crushed to the right and left. The remaining caudals, 30th–70th, lie upon the left side apparently in a natural position. The pelvis and hind paddles have evidently shifted backwards in settling, so that the mooted question of the position of the sacral vertebra cannot be positively settled by this specimen.

This specimen agrees very closely in size with Cope's cotype of *T.* (*Liodon*) *dyspelor*, founded in 1871 at Fort Wallace, Kansas, and described by him in the 'Cretaceous Vertebrata' (p. 167). The skull agrees exactly in size with the fine one mounted in the Munich Museum, described by Merriam (1894, Taf. II.) as *T. proriger*. Size is no criterion, or at best an uncertain criterion of a species, but Williston advances (1898, p. 175) no other satisfactory means of separating *T. dyspelor* from *T. proriger*. Thirty-five feet is the length assigned by this author to the largest Tylosaurs, a length considerably exceeding that of the present specimen. It is evident, however, that a

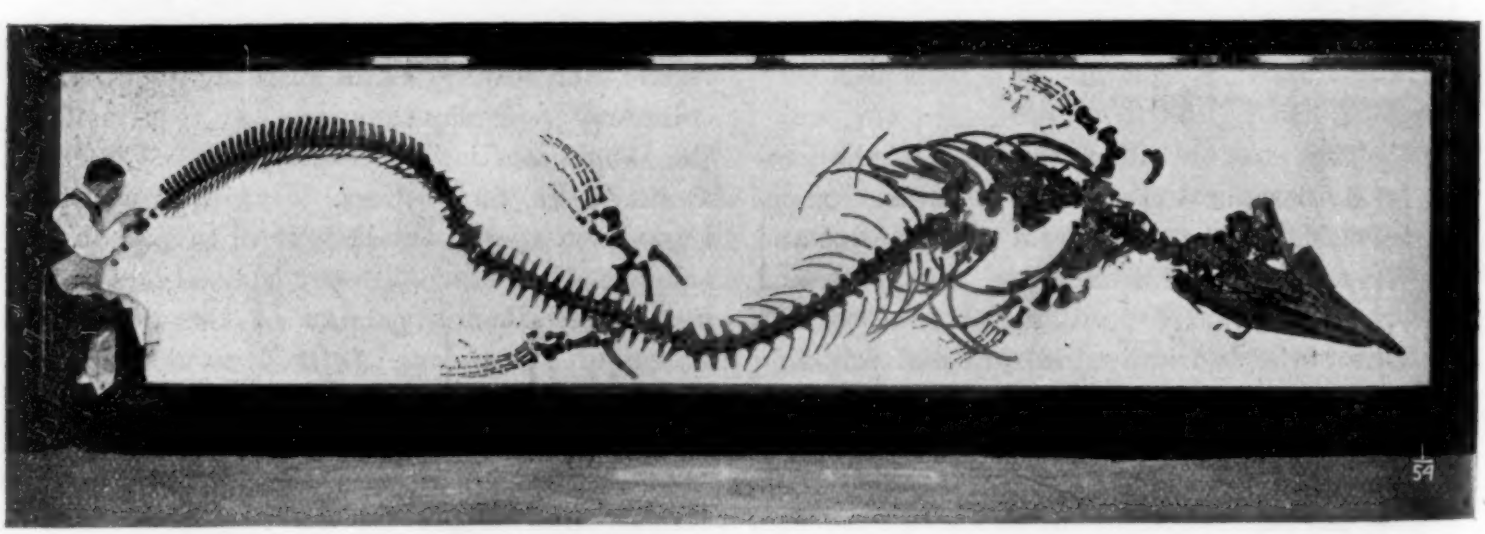

Fig. 1. Complete skeleton of *Tylosaurus dyspelor* in frame. $\frac{1}{54}$ nat. size.

young *T. dyspelor* might exhibit exactly the measurements of *T. proriger*.

According to Williston the tail terminates very abruptly in *Tylosaurus proriger*, in contrast with its gradual and slender termination in *Platecarpus*. If this was the case in this specimen of *T. dyspelor*, we should not allow more than 15 inches or 38 centimetres additional, giving us a total length of about 29 feet or 8.83 metres. The *proportions* of different regions of the body are very characteristic of different genera of Mosasaurs. In this individual the total of 29 feet or 9 metres is roughly distributed as follows:

	Feet.	Metres.
Head and jaw	4	1.22
Neck	2	.61
Back	8	2.44
Tail	15	4.56
Total	29	8.83

Thus the back is four times the length of the neck, twice the length of the head, and about one-half the length of the tail. In other words, the tail is longer than the other regions of the body combined. These proportions are carefully observed in Mr. Knight's restoration.

There are positively *seven cervicals*, the number assigned to all the American Mosasaurs by Williston, and this point is of considerable importance as bearing against the supposed Dolichosaurian affinities of the Mosasaurs. In this specimen there are certainly *twenty two dorsals*, while Williston assigns *twenty-three dorsals* to *Tylosaurus proriger*. Merriam assigns twenty-three dorsals to *Tylosaurus* (*op. cit.*, p. 15). Williston is undoubtedly correct in placing the pelvis upon the first non rib-bearing vertebra, which thus represents the *sacral*.

In this specimen, as in the living Monitor lizards, the 30th vertebra behind the head is distinguished by the absence of a rib, and by the sudden expansion of the diapophysis. This first expanded vertebra, as determined by Williston, must be considered the sacral, analogous with the most anterior of the *two* sacrals in *Varanus*. This vertebra is not perceptibly different in size from the pygals behind it. Unfortunately the tips of the diapophyses are not preserved, and there is no means of demonstrating positively that the ilium was attached by joint or ligament.

There are no lumbars. The number of pygals, or non chevron-bearing caudals, cannot be determined, because many chevrons are not exposed.

The vertebral formula is therefore as follows:

Cervicals	7
Dorsals, with sternal ribs	10
Dorsals, with floating ribs	12
Sacrals	1
Caudals and pygals	72 + (=86).

A most interesting feature is the adaptive modification of the mid-caudal centra and spines, apparently for the support of a dorsal *caudal fin*. Dr. W. D. Matthew first directed the writer's attention to this structure.

Williston has figured the caudals of *T. proriger* as having spines of a nearly uniform height, while in *Clidastes velox* (*op. cit.*, p. 152) he describes an extension of the spines as probably designed to support a fin. This specimen of *T. dyspelor* shows as evidence of a fin:

1. A slight upward elongation of the spines in the mid-caudal region, beginning at C. 24 (in which the spine measures 10 centimetres) to C. 39–40 (in which the spine rises to 11 centimetres) and subsiding to 10 centimetres in C. 58. At the same time the spines change from a pointed and backwardly directed to a more square, upright, and truncated form. The vertical spine is upon C. 39; in front of this the spines of C. 1–38 lean backwards; while behind this the spines of C. 40–70 lean forwards, or are nearly upright. 2. There is some further evidence that the *upward*

curvature of the spine, is natural, and not due to post-mortem disturbance. This curve is beautifully indicated between C. 30 and C. 63; behind which the vertebræ dip down into the extremity of the tail. It is difficult to verify the existence of this curve in the living state by the measurement of the superior and inferior diameters of the centra. So far as measurements can be relied upon they tend to show that the vertebral centra were slightly longer above than below and thus produced the curve; the relations of the greatly reduced zygapophyses and the antero-posterior width of the spines also point to the same conclusion, for they show that if this column were straightened out the spines would come into contact. This condition is so unique, however, that it must be put forward with reserve.

The sharp ventral flexure or angulation of the tail of *Ichthyosaurus*, below the swelling of the caudal fin is not analogous to the very gradual upward curve in *Tylosaurus*.

We are now enabled to form a very clear idea of the general structure of the thorax, although certain details are still missing. All the true ribs are preserved on both sides, and, in spite of the havoc wrought in the removal of the chest region, we find all but one of the cartilaginous ribs on the left side and extensive portions of those on the right, as well as the central area of the sternum. The careful studies and drawings of this region by Dr. J. H. McGregor show clearly the relations of the actual and restored region, part of the preserved region being covered by the vertebræ and ribs.

The *cartilaginous ribs*, consist of broad bands which are closely concentrated and parallel as they converge towards the sides of the sternum, affording an exceedingly strong support for the thorax. The *floating* ribs decrease steadily in length and curvature. The coracoids do not unite in the median line as represented by Marsh, nor are they approximated as restored by Dollo in *Plioplatecarpus*. They are widely separated by epicoracoid cartilages having a united transverse diameter of about 22 centimetres. The inner ends of the bony coracoids are thus nearly nine inches apart. About one-half of the *sternum* is visible or preserved; as the cartilaginous ribs on the left side are nearly *in situ*, and those on the right approximately so, it is evident that the sternum had a triangular outline, thinning posteriorly for the junction of the 10th pair of cartilaginous ribs.

The sterno-coracoid plate thus corresponds closely with the Lacertilian type and bears a general resemblance to those of *Trachydosaurus*, *Varanus* and *Cyclodus*, as figured by Parker. There is no evidence of the presence of an episternum (interclavicle).

Behind the basioccipital is observed a supposed lateral cartilage of the larynx? *lx.* and its mate? *lx.* appears below just between the right pterygoid and quadrate. A bit of cartilage appears behind the left quadrate, another mass in front of the right quadrate, while the trachea extends from below the axis, is unfortunately destroyed as far back as the 5th rib, and diverges into the two bronchi just behind the coracoids. The tracheal rings are well exhibited.

The appendicular skeleton is remarkably well preserved. The *scapulæ* are fully exposed upon both sides, with the characteristic short and broad bony blades and the extensive crescentic cartilaginous suprascapulæ.

COMMON CHARACTERS OF FORE AND HIND PADDLES.

The metapodials and podials are somewhat displaced, but they enable us to make a reconstruction of the manus, aided by Williston's excellent photograph and outline of the paddle in *T. proriger*.

1. *Hyperphalangism* is a chief characteristic of the Tylosaur extremities. Williston's photograph shows 47 actual elements, to which 3 are added in his restoration of

T. proriger, making 50. Thirty-eight (38) elements are preserved in the left *fore paddle* or manus and 44 are inserted in our restoration, or 5 metacarpals and 39 phalanges. In the *hind paddle*, or pes, 33 metatarsals and phalanges are preserved on the left side (including an isolated phalanx which lies above the 50th caudal).

The phalangeal formula is *estimated* as follows :

		MANUS.	PES.
Digit	I.	5	5
	II.	8	8
	III.	8	8
	IV.	9	8
	V.	9	6
		T. dyspelor.	*T. dyspelor.*

It is apparent, so far as we can judge from this specimen, that in *T. dyspelor* the phalanges are less numerous than in *T. proriger*.

2. A second characteristic is the *marked broadening and shortening of the 5th metapodial* in both manus and pes, but especially in the pes. The carpus and still more the tarsus, on the postaxial (ulnar and fibular) sides are abbreviated. The result is that the 5th digit is drawn towards the body ; its elements and joints alternate with those in the I.–IV. digits; as a whole it is set wide apart. Williston has recently shown that the epidermal fin web conforms in its contours to this peculiarity.

3. A third characteristic is the *alternation of the joints in the 1st and 5th digits* with those in digits 2, 3, 4. The pes further agrees with the manus in the expansion of the proximal part of metapodial I., and the shortening or drawing up of the first finger, whereby the middle points of the phalanges of Digit I. come opposite the joints of the phalanges in Digits II., III., IV., thus greatly strengthening the paddle as a whole. A similar adaptation by alternation of the phalangeal joints is observed in some of the Plesiosaurs, in which it is carried to an extreme, for the phalanges of all the digits alternate.

This specimen affords an exceptionally favorable opportunity for a restoration of the skeleton. This interesting work has been accomplished by coöperation. Dr. W. D. Matthew kindly undertook a natural-size drawing of the entire animal, succeeding especially in rearranging the vertebral column and skull. Mr. Horsfall completed the details of the skull by careful measurement and comparison with the drawings of Merriam and Williston. Dr. McGregor and the writer restored the paddles and the sternum.

The drawing is upon a one-eighth scale. There was probably a small rib upon the third and fourth cervicals which has not been indicated. The cervical intercentra are restored from a fine specimen of *Platecarpus*.

One of the most important features of the restoration sprang from the discovery that the cartilaginous ribs of the left side are practically in their normal relations. This fact enabled us to locate definitely the lower end of the ten true ribs, the sternum, the epicoracoids, and at the same time fix the position of the fore paddle with reference to the skull.

As above noted, the ribs were found to resemble those of *Sphenodon* much more closely than those of *Varanus*. They are thus given in the restoration the angle, position, and foreshortening characteristic of *Sphenodon*, as the narrow anterior part of the chest expands into the broader walls of the abdomen. The ribs in the plate are perhaps a shade too heavy.

The upward curvature of the tail is designed exactly as the vertebræ lie in the specimen, for the reasons already discussed.

RESTORATION OF THE ANIMAL.

In the restoration of the animal, Mr. Charles Knight has taken advantage of all the information afforded by Professor Williston's collections and descriptions, and of our detailed study of this fine specimen.

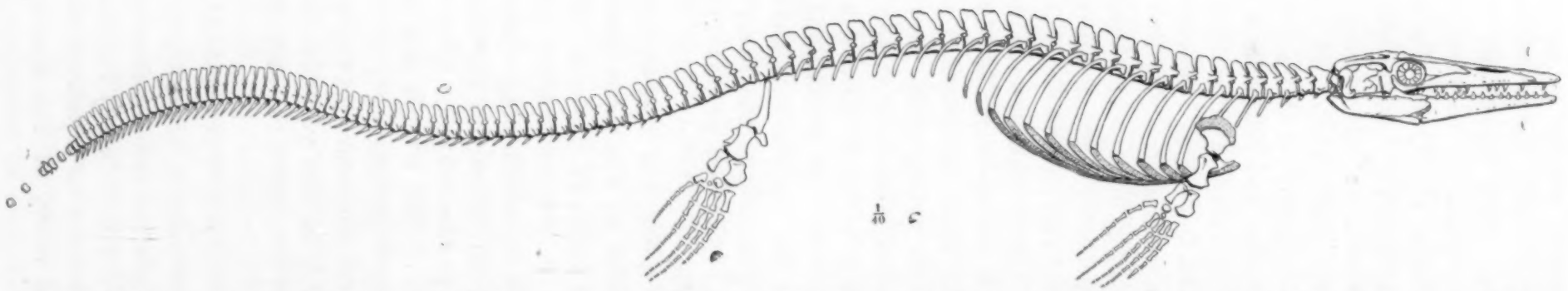

FIG. 2. Reconstruction of the Ram-nosed Tylosaur, after drawings, by W. D. Matthew and Bruce Horsfall, under direction of the author. $\frac{1}{10}$ nat. size.

FIG. 3. Restoration, by Charles Knight.

The animal was first carefully modelled upon a one-ninth scale.

Tylosaurus was a very powerful sea swimmer, propelled chiefly by the lateral motions of the body and tail. The caudal fin was a broad expansion along the dorsal line. The proportions can be precisely determined. The fore and hind paddles were similar in action and played a subsidiary part in guiding the animal, but were effective in the less rapid motions of the body. The indentation of the paddle border between the 4th and 5th fingers is upon Williston's authority. The nuchal fringe is also from this author's recent description of *Platecarpus*. The epidermal scaly covering is from Chancellor Snow's account of the *Tylosaurus proriger* covering. The expression of the top of the skull resembles that of *Varanus*, but in other points there is a wide departure from the Varanoid type.

The facts derived from this skeleton do not strengthen Baur's extreme opinion as to the intimate connection of this type with the Varanidæ. Besides the secondary degenerate adaptation to marine life shown in the girdles and appendicular skeleton, there are certain fundamental differences in the basioccipitals and ribs, in fact in all parts of the skeleton. These differences fully balance or overweigh the likenesses, which have long been dwelt upon by Cuvier, Owen and Baur, between the Mosasaurs and Varanoids, and do not even justify the assertion that the Varanidæ and Mosasaurs sprang from a common stem. The Mosasaurs are a very ancient marine offshoot of the Lacertilia, retaining certain primitive and generalized Lacertilian characters and presenting a few resemblances in the skull to the Varanoids; they are very highly specialized throughout for marine predaceous life, and constitute a distinct subdivision of the order Lacertilia.

HENRY F. OSBORN.

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THE INDIANA UNIVERSITY BIOLOGICAL STATION.

THE advantages of biological stations for purposes of research and instruction have had many advocates in recent years.

"There can be little doubt" says Parker, "that the study of zoology is most profitably as well as most pleasantly begun in the field and by the seashore, in the zoological garden and the aquarium." "The establishment of biological stations has done more to advance the study of zoology than any other one thing in this generation," says Conklin. "Certain desiderata are evident," adds Kofoid, "more biological stations, so that the conclusions arrived at in one locality may be extended and corrected in a score of others; and finally some biological Froebel, who shall demonstrate the disciplinary and cultural value of ecology as a field of biological instruction and establish a standard for others to imitate. In their work we may look for the happy combination of the sympathetic observation of the old-time naturalist, the technical skill and searching logic of the morphologist, and the patient zeal and ingenuity of the experimental physiologist, a combination, let us hope, that shall unlock not a few of the secrets of the world of life."

"It is unquestionably true that the tendency within recent years" says Ward "has been to make the university trained scientist a laboratory man, unacquainted with work out of doors and among living things. * * * Thus, both through the influence of the investigators in the case of those stations which do not carry on directly any educational work, and through the teaching of those which do conduct summer instructional courses, new life will be instilled into the teaching of natural history throughout our country."

The Biological Station of the Indiana University was planned with a well defined object in view, the study of the variation of

the non-migratory vertebrates in some unit of environment. The station was to be located on a lake which would present well circumscribed boundaries within which the conditions were supposed to be nearly uniform at any time and from season to season. Here large numbers of all the non-migratory vertebrates were to be collected, their characteristics tabulated and compared with similar series from other lakes. We were, in short, to conduct a statistical inquiry into evolution.

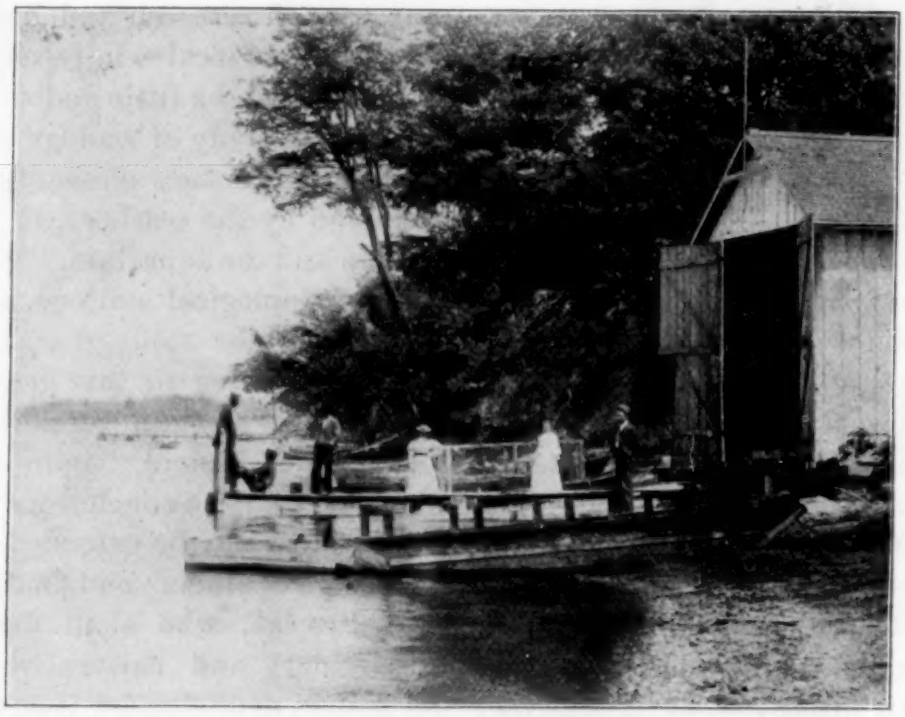

Fig. 1. The Biological Station During its First Year at Turkey Lake.

Fig. 2. The Station During Succeeding Years at Turkey Lake.

For the work in hand many of the lakes were available. Our location was therefore determined by the finding of an old boat-house suitable for a laboratory on the shore of Turkey Lake.

For the first year the trustees of the university granted the use of the apparatus of the zoological department provided the station would in no way be an expense to the university. After the first year the trustees provided generously for the permanent equipment of the station. To help defray expenses a number of courses of instruction were offered for a few students.

Certain restrictions reduced this number to 91 during the present season. The large increase in the number of students kept us more than busy to provide for their increasing needs, but the collection of the material for the study of variation was not neglected.

At the end of the fourth year the station was moved to Winona Lake where the facilities for caring for the increasing number of students are much better. Two buildings were erected and given to the station by the Winona Assembly and Summer School. They are situated in the angle where Cherry Creek enters Winona Lake,

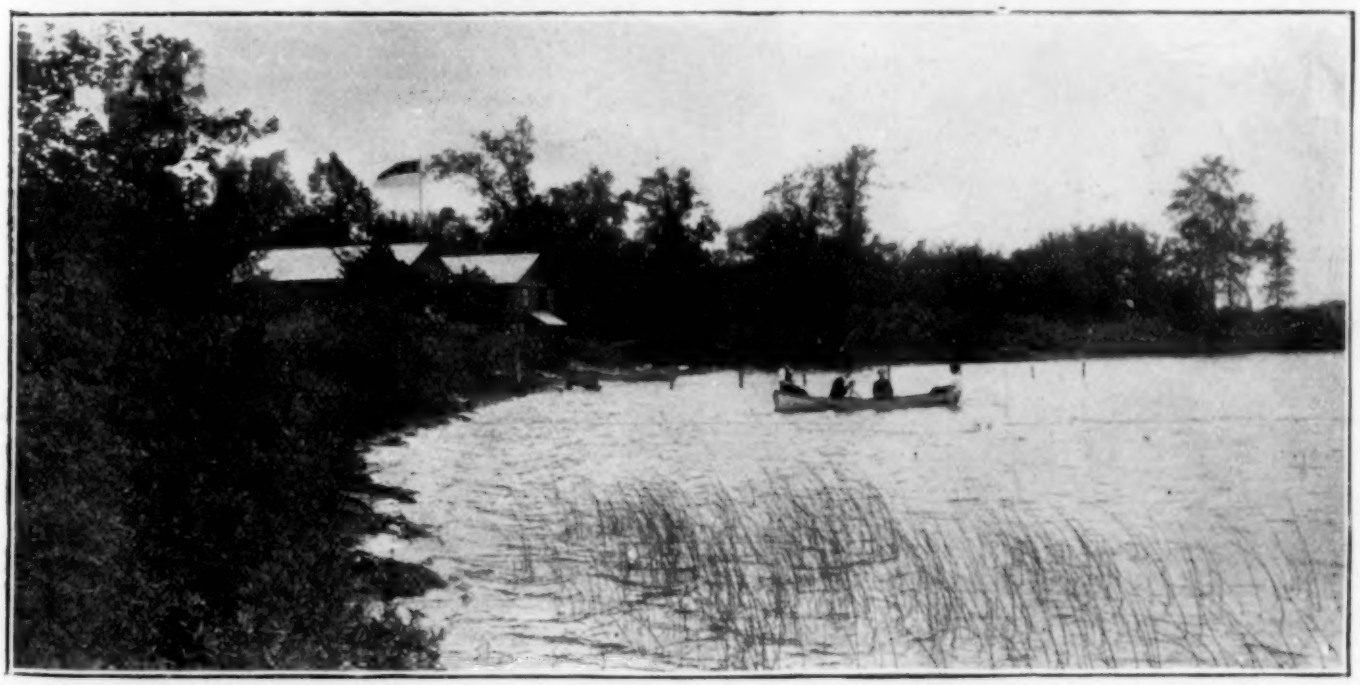

FIG. 3. The Environment of the Biological Station at Winona.

It was expected that there would be about ten in the party the first year, but there were nineteen.

The conditions for biological work, coupled with camp life on a fine lake, five miles from the nearest village and free from university lecture-hour appointments, proved so attractive that during the second summer the number of students rose from nineteen to thirty-two, and in the third to sixty-three, and in the fourth to 103, representing eight States.

eighteen miles from the original location. They are surrounded by a great variety of natural conditions of water, woods, swamps and meadows. The buildings are 20 by 45 feet. One or both will be lengthened to 60 feet during the winter.

The special feature in the construction is the cement floors of the ground story. This arrangement makes the tables on these floors nearly independent of people moving in any part of the buildings. On one of these floors there are private laboratories,

the lake survey laboratory and the office of the director. The lower floor of the second building is given to embryology and bacteriology. The notable feature of this floor is the (accidentally) constant temperature closet of the bacteriological laboratory. This is simply a pit beneath the stairway surface midway between the two buildings. From this we get a flow of about 5,000 gallons per day. The water is received in a small tank and this is tapped by pipes leading to each floor of the buildings where there are small pitcher pumps. The overflow from the receiving tank leads into a

Fig. 4. The Buildings of the Station from the Mouth of Cherry Creek.

about a foot deep and cemented. The temperature without the use of ice did not vary more than 1° from 20 centigrade during the entire summer. The upper floor in one building is given to elementary zoology and that of the other to botany. We have small sheds for incubators away from the buildings to avoid the danger of fire. The bacteriological kitchen and the lecture room are separate tents. The most urgent need of the station is a building for general lectures and for embryology.

The water supply deserves mention. Artesian water was struck 75 feet below the larger steel tank with covers. This tank is used for experiments with blind fishes. The overflow from this leads into pools constructed for experimental work.

The springs about Winona Park flow in part into decorative pools. These will be used for the experiment in rearing cave animals in the light. One of them about thirty feet long is now inhabited by an experimental colony of blind Amblyopsis where their habits can be observed without the restrictions imposed by the conditions found in a cave.

In recognition of the fact that "the

teacher who has no time for research rapidly becomes an ineffective and uninspiring teacher, and that overteaching defeats its own ends," the instruction should be in the nature of a guiding, the giving not of a string of recipes, but of sound principles enabling the student to work out his own salvation.

Since, wherever he may go, the student must adapt himself to his environment, it is the plan to catch what we can and study what we catch rather than to follow fixed courses. The facilities for catching, however, are very favorable. We have the lake in front of us, the woods behind, the creek on one side, and a meadow on the other. Here the entire day of the student is given to collecting and exploring expeditions, lectures and laboratory work.

During the past summer courses of instruction have been given in zoology, botany, cytology, bacteriology, embryology, and survey methods. As soon as the necessary buildings can be secured, courses in neurology and comparative psychology and physiology will be added.

The department of instruction is self-sustaining, but facilities for research are still limited and here is an opportunity for some public spirited citizen.

"Research in all directions, in fact, meets with such reward that it should be sustained by all persons who desire to encourage the progress of knowledge. But the rich men of our country do not discriminate between this function and that of teaching. They found universities with princely liberality, but research has to struggle with poverty of means and deficiency of time. Great libraries are founded, but the work in the laboratory from which issue the books which create libraries receives comparatively little substantial encouragement. * * * Initiative and discovery are the conditions of progress, and no better service could be rendered to humanity than the creation of opportunities for their activity."

C. H. EIGENMANN.

SCIENTIFIC BOOKS.

Alaska and the Klondike. By ANGELO HEILPRIN. New York, D. Appleton & Co. 1899. 8°, pp. X, 315, illustrations and maps.

Professor Heilprin has given us a book which is a combination of personal travel and adventure, with statistics, a synopsis of mining laws, and other data interesting to the traveller or miner. With these, which do not especially concern the readers of SCIENCE, are some observations on the physical geography and geology which are deserving of consideration.

The author started from Skaguay by the White Pass route, July 30, 1898, arriving at Dawson, August 6th, and leaving on the 20th of September, for the outside world by the same route. The general geology of this region had previously been studied by McConnell, Dawson, Spurr, Russell and others, whose observations may be found recorded in the publications of the Dominion and United States geological surveys.

Professor Heilprin found the summer climate not unpleasant, and, *mirabile dictu*, encountered no mosquitos in the mining region. So his survey of the geological conditions was not interfered with by annoyances which disturbed the philosophic calm of most of his predecessors in the same field.

He notes conditions which confirm the opinions held by previous explorers as to the probable existence of large bodies of fresh water over much of the present placer region. The well-known bed of volcanic ash which extends for hundreds of miles along the Upper Yukon a little below the present surface of the ground, is believed by him to have been deposited in water. In the alluvium above and below it he noticed fresh water shells in a fossil state, a feature which has been observed in many places lower down the river. Though these deposits are entirely compatible with the hypothesis of the existence of an extensive lake in the region, they cannot be adduced in proof of it, since the small summer pools which are

very common on the tundra often swarm with *Limnæa*, *Physa*, *Pisidium* and *Valvata*. The marl which results is in some localities so abundant, that at Old Fort Yukon it was collected, ground up and mixed into whitewash which was used on the buildings of the original trading post, nearly forty years ago.

In the vicinity of the Klondike the author notes the hummocky appearance of the hills 'very much like magnified morainic knolls in a glaciated country,' though having a considerable elevation. Water worn pebbles and remnants of terraces up to nearly twelve hundred feet were observed by him personally.

Notwithstanding the evidences of antiquity afforded by some features of the landscape, Professor Heilprin considers that many of the more pronounced features of the region are comparatively recent. While the placer gravels of the streams and benches seem to indicate more than one denudational phase, and the principal stream-valleys are wide and open, many of their lateral tributaries are narrow and V-shaped, and the former appear to have been modified by late stream displacements. The present stream-beds, even of the Yukon, are not the most conspicuous orographic depressions but have been carved out much more recently, and it is even suggested that the emergence of the land from lacustrine conditions may have happened 'a few hundred years' ago.

The author estimates that denudation in the immediate valleys of the main streams is taking place at the rate of a millimeter a day, which, according to his computation, would equal 'a valley trough of about a foot and a third' in a single year. Allowing one hundred and twenty days for the period when erosion is not wholly prevented by congelation, the reviewer computes that the total denudation for the year would amount to less than five inches at the author's rate. Now the summer rainfall for the Upper Yukon is very small, less than an inch a month, and the surface of the ground is covered with a dense spongy mat of vegetation. There seems to be no particular reason why there should be any appreciable denudation, except in the actual beds of the streams themselves. The water of all these small non-glacial streams is notably clear, and they carry practically no sediment at the points where they enter the main river. Consequently it seems probable that the estimate of Professor Heilprin requires revision, even his second one, in which he proposes a rate of 175 feet in five hundred years. For a short period, and in certain limited portions of its bed the Yukon is able to move a considerable weight of débris, but the gravels and sands in great part antedate the existence of the present river, which has actually cut through them at but a few points in its 2000 mile course.

Professor Heilprin, in view of his limited opportunity for research, very properly disclaims any attempt to decide upon the geological structure of the region. However he devotes a good deal of space to an argument in favor of the deposit of gold in the placers, not from preëxisting stringer leads or veins in the country rock, but as a deposit, *ab initio*, from gold held in solution in water, upon or among the already deposited gravels. This is a contention which may properly be left to metallurgical experts to discuss, to the reviewer it seems unsupported by any direct evidence in this region. The author agrees with previous observers in affirming the non-glaciated character of the Klondike, and the presence of comparatively recent indications of volcanic activity. Pleistocene mammals are represented by fossil bones in the gold gravels as elsewhere in Alaska, and there is little doubt that the placer deposits as a whole are post-glacial and their material largely due to denudation by ice action during glacial times.

W. H. Dall.

The Design and Construction of Dams, including Masonry, Earth, Rock-Fill, and Timber Structures; also the principal types of Movable Dams. By Edward Wegmann, C.E. Fourth Edition, revised and enlarged. New York, John Wiley & Sons. 1899. Quarto, cloth, xii + 250 pages, 97 plates. Price, $5.00.

Many mathematicians have occupied themselves with the deduction of the shape which a high masonry dam should have in order to possess both stability and economy. Such economic profiles are of interest and value to the designer, but practically each engineer de-

vises his own economic profile to satisfy the imposed conditions. The method developed by the author is an excellent one for this purpose, leading to no complicated equations and having the advantage of constantly keeping before the computor the statical principles of stability and strength.

The fundamental assumption in these computations is that the compressive stress on the base of the dam uniformly varies from a minimum value at the back face to a maximum value at the front or down-stream face. This assumption cannot be a correct one, except in the case of a rectangular section, but it may be properly used in the absence of knowledge as to the correct distribution of stress, because its errors are on the side of safety. Strictly the base of the dam is under a shearing stress due to the horizontal water pressure as well as under a compressive stress due to the weight of masonry, and of the former no account is taken in practical computations. Probably the error in the fundamental assumption regarding the compression more than balances the opposite error, due to the neglect of the shear, so that masonry dams designed under the common theory undoubtedly possess all the needed element of security. This conclusion may be justified by the fact that masonry dams rarely fail; the author mentions but three instances of failure, two of these being constructions of the eighteenth century when the principles of design were not well understood, and the third being a case where the stone and cement were of so poor quality that leakage occurred.

Previous editions of this work were devoted entirely to masonry dams. The present edition gives additional information regarding recent structures, and also includes the description of dams of earth, timber and loose rock. For such structures few computations are needed, the size and shape being determined almost entirely by experience, while the details may vary according to local conditions and the judgment of the engineer. The numerous devices adopted in California to construct rock-fill dams without leakage are of especial interest. Movable dams of the needle, shutter, and bear-trap types are also fully described; although only a few of these have been built in America, they will undoubtedly be extensively used in future river improvements.

The work forms the most complete treatise on the subject of dams that has yet appeared. With commendable industry the author has searched the annals of engineering literature in order that no important structure might escape notice, and his list of bibliography, covering five pages, will be of value to all engineers. From the descriptive point of view, the book gives nearly all needed information regarding the important dams of the world. From the theoretic point of view, it gives everything necessary regarding masonry dams which resist overturning by virtue of their weight alone, but it is somewhat lacking in regard to the theory of arched dams. This theory, it is true, is a difficult one, but, as the Bear Valley dam in California, and the Zola dam in France, depend for their stability largely upon the arch action, a numerical discussion of their stability would have been of interest and value. Without doubt a dam arched toward the current is stronger than a straight one of the same cross-section, particularly in the emergency of ice thrust or a high flood, and it is said that the instinct of the beaver leads him to so construct them. Even if a little more material be required, it is well for the engineer to make his masonry dam an arched one and thus render the structure one of beauty as well as one of strength.

M. MERRIMAN.

The Botanists of Philadelphia and their work. By JOHN W. HARSHBERGER, Ph.D. Philadelphia. 1899. 8 vo. Pp. 457.

In this octavo volume of 457 pages we have a collection of brief biographical sketches, not only of all the people who have contributed to a knowledge of the flora of Philadelphia and the area included in a radius of sixty miles, but nearly all who have studied it afield. Commencing with such well-known pioneers as John Bartram, Humphry Marshall, Muhlenberg, Barton, Schweinitz, and Darlington, it comes down to the present members of the various botanical clubs of the city, the whole series arranged in chronological order. The Bartram Gardens, the collections of the Philadelphia Academy of

Science, the botanical department of the University of Pennsylvania, and the various field clubare fully exploited, the pages being interspersed with numerous half-tone illustrations of points of botanical interest, in addition to many excellent portraits, the full-page illustrations amounting to forty-eight. The work is written in a pleasing style, is well printed, and forms an attractive volume. The portions relating to the earlier botanical workers who gave to Philadelphia its early botanical prestige are particularly interesting. Additional matter of general interest is found in the historical account of the scientific journals and serial publications that have been issued from Philadelphia. An interesting account of the historic trees of the vicinity closes the work.

The author is sanguine that Philadelphia 'is peculiarly fitted to be the botanical center of America,' and his references to 'the metropolitan life and publishing houses' of New York on the one side, and 'the libraries and scientific departments' of Washington on the other, illustrate well how near one can live to cities and yet fail to appreciate their most salient features.

LUCIEN M. UNDERWOOD.

The Maturation, Fertilization and Early Development of the Planarians. By WILLARD G. VAN NAME. From Trans. Conn. Acad., Vol. X., p. 263–300, pl. xxxvi.–xli. August, 1899.

The author has studied the early life history of *Eustylochus ellipticus* (Girard), and *Planocera nebulosa* Verrill with great care. The characteristic features of each structure are presented, so far as could be determined from the study of the material, which is not favorable for the solution of certain points. While the results obtained agree in the main with those of previous observers, light is thrown on a number of doubtful points. Especial mention may be made of the discussion of the centrosphere and its parts, as well as that on the interesting modifications in the form of the chromosomes. The paper is well illustrated. H. B. W.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 313th meeting of the Society was held Saturday, December 2d. W. H. Dall exhibited a specimen of the fruit of a species of *Barringtonia* stating that it was used for capturing fish, the kernel being bruised and cast into small ponds or streams whereupon the fish became stupefied and rose to the surface, where those that were wanted were gathered. The effect upon the fish was only temporary, those not taken soon recovering.

Frederick V. Coville showed an entire and a bisected cone of *Pinus alternata* both covered with lichens. Mr. Coville stated that these cones remained on the trees from 20 to 50 years and seemed to open and release the seeds only when exposed to great heat, so that no seedlings of this pine were to be seen except where the ground had been swept over by fire.

L. H. Dewey spoke on 'Frost Flowers,' saying that this name is applied to peculiar formations of ice found on certain plants on frosty mornings in fall and early winter. They are most frequently observed on dittany, *Cunila origanoides;* frostweed, *Helianthemum canadense;* marsh fleabanes, *Pluchea camphorata* and *P. fœtida*, and on the Pacific coast on the cultivated heliotrope. The first published record of the phenomenon appears to be that of Dr. Stephen Elliott, in 1824, who observed it on *Pluchea fœtida* ('Conyza bifrons') and made a note of it in his 'Botany of South Carolina and Georgia.' It has since been observed, studied and written about by many botanists and physicists. It is apparently purely physical in character, due to capillary movement of water and the action of frost, but no thoroughly satisfactory explanation has yet been given why it should be found on only about twenty-six species of plants and not on others. Further observations in the field at this season are needed to determine whether frost flowers may be found on species other than those recorded, and also further studies are needed on the structure of plants exhibiting the phenomenon.

H. J. Webber presented a paper 'The Effect of Hybridization in the Origination of Cultivated Plants,' calling attention to the remarkable development of certain of our cultivated plants, due to the effect of hybridization. It was pointed out that this is particularly true in the grape where 57 per cent. of the sorts of known parentage are hybrids while only 29 per cent.

are selected seedlings, and 14 per cent. chance seedlings, or wildlings. In pears, plums and other fruits important developments due to hybridization were pointed out, and special attention was called to the plum where a gradual amalgamation of our native plum with the Japan plum, *Prunus triflora;* and apricot plum, *P. Simoni*, is being brought about which bids fair to ultimately revolutionize plum culture. Instances were also cited where epoch-making improvements had been secured in corn, wheat, peas and tomatoes.

O. P. Hay discussed 'The Chronological Distribution of Elasmobranchs' presenting a diagram which showed by means of one set of curves the chronological distribution of the species of North American elasmobranchs and by another set the distribution of those of Europe. A table was also given which showed the genera belonging to each of the geological periods. The relationship of the paleozoic families of skates to those of the Neozoic was also considered.

O. F. COOK,
Secretary.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

AT the 506th Meeting of the Society held at the Cosmos Club, November 11th, informal communications were made by Dr. A. Martin on the extraction of the 4th root by successive subtractions; and by Mr. Marcus Baker, on his recent duties in Paris in connection with the Venezuelan boundary arbitration. The first regular paper was by Mr. R. H. Strother, on 'Some Observations on a Problem in Dynamics.' The problem was how a cat turns over in the air, and was illustrated by Professor Marey's photographs of a cat turning over while falling, and by a model which performs the same feat. The model consists of two cylinders of wood connected by elastic bands. Each of the cylinders describes a continuous complex motion, one of the components of which is a rotation about its longitudinal axis, the motion being such that the sum of the moments of momentum is constantly equal to zero. It is possible for a ring to describe a motion in its own plane such that its moment of momentum is zero, but involving a rotation of the ring about its center.

Following this paper, Mr. J. Elfreth Watkins gave a chapter from the early history of mechanics.

The 507th meeting was held November 25th in joint session with the Chemical Society of Washington and was devoted throughout to the Atomic Theory. Papers were read by Messrs. J. S. Ames, F. H. Bigelow, H. N. Stokes, Cleveland Abbe and F. K. Cameron. A general discussion followed, in which members of both societies participated.

E. D. PRESTON,
Secretary.

ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

THE 295th Regular Meeting of the Society was held Tuesday, November 21, 1899.

Mr. Wm. F. Willoughby read a paper on 'The Housing of the Laboring Classes in Europe with Special Reference to France and Belgium.'

Mr. Gustavus A. Weber read a paper on the 'Housing of the Laboring Classes in the United States,' and Dr. Geo. M. Kober presented a paper entitled 'The Housing of the Laboring Classes in the City of Washington,' in which he said in part that the question of housing the wage-earners in cities is one of extreme interest to students of sociology and municipal hygiene, and the movement to supply improved, wholesome houses at reasonable rentals in the National capital owes its beginning largely to the labors of members of the Civic Center and of the Woman's Anthropological Society.

The Civic Center Committee on housing the people has for its fields of work, the investigation of the alley houses and slums with special reference to sanitary and sociological conditions, and their effect upon the health and morals of the inhabitants.

From the results of this investigation the objections to our alleys may be summarized as follows:

1. The existence of blind alleys or cul-de-sacs shutting off small communities from the outside world, and which are calculated not only to promote sickness, but also immorality and crime.

2. Insanitary conditions of the alleys and

alley dwellings, which menace not only the health of the immediate inhabitants, but also of the people residing in the same block.

3. The undue prevalence of immorality and crime, since it may be taken for granted that the majority of alley tenants suffer positive deterioration from witnessing the uncurbed vice around them.

4. High rents in proportion to the income of the families especially in consideration of the accommodations offered and the actual value of the property.

The Committee made important recommendations which were endorsed by the Central Relief Committee on January 27, 1897, and public interest was sufficiently aroused to lend to the organization of the Washington Sanitary Improvement Company, whose objects are to offer to capital a safe 5 per cent. investment and at the same time supply to wage-earners sanitary houses at reasonable rentals.

It should be stated that while the original intention was to provide homes for the alley residents and thereby remove the slums, it was considered best to begin this movement by providing improved dwellings for the better class of wage-earners, in the belief that houses vacated by them would be rented by the next grade, and so on until the bottom of the ladder was reached. It is believed that in work of this character it is always best to begin at the top. Had the company acted otherwise, the undertaking would probably have resulted in failure. As it is, the company has already erected 28 two-story flats, each constituting a distinct and complete house of three or four rooms, with bath, with separate entrance, exit, and separate yards and cellars. The company has established a high standard of sanitary homes for wage-earners at reasonable rent, and, unless other landlords pursue the same course, it will continue to supply the demand. The company grants one month's rent free to every tenant, or so much thereof as has not been expended during any one year for interior repairs. Exterior repairs necessitated by the elements are not charged against tenants. No officer of the company receives any compensation, and this, together with the exercise of strict economy and careful business methods, has enabled the directors not only to pay 5 per cent. dividends on all moneys invested in the company from the beginning, but also promoted the philanthropic aspect of the enterprise by providing the very best accommodations from the standpoint of hygiene, and as to comfort, the utmost which a given cost will permit.

J. H. McCormick,
Secretary.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY. NEW YORK ACADEMY OF SCIENCES.

The regular meeting of the Section was held on November 27th. The entire meeting was devoted to the presentation of papers on anthropological subjects. At the next meeting the program will consist of psychological papers.

Dr. Franz Boas reported on the Eskimo tribes of Hudson Bay according to observations made by Captain George Comer of East Haddam, Conn. He described particularly the natives of Southampton Island, who heretofore have never been visited. The arts of the tribe show a peculiar development, owing to the lack of materials with which other Eskimo tribes are well supplied. The traditions of the tribes of the west coast of Hudson Bay show remarkable analogies to the traditions of the Athapascan tribes of the McKenzie region. The well-known tradition of the Magic Flight was among those recorded by Captain Comer. There are traditions which make it clear that the Eskimos of this region believed in the transmigration of souls. The dress of the women is very remarkable, and it is suggested that the enormous pockets of their stockings may be the survivals of the custom of carrying the children in the boots, as is still done by the Eskimo of Pond's Bay.

Dr. A. Hrdlicka read a paper on the Navahoe Indians. The physical characteristics of these Indians were fully described, and a number of measurements made on fifty adult males and thirty adult females were given in detail. Observations on the life and social and industrial habits of the tribe were also presented. The language belongs to the Athapascan group. From the physical examinations it appears that the tribe, notwithstanding some evident mix-

ture, is radically allied to the ancient Pueblos and to the short-headed people of to-day in other parts of New Mexico and Arizona, and possibly in old Mexico.

Dr. M. H. Saville presented a paper entitled 'Notes on the Mexican *Codex Telleriano-Remensis*.'

CHARLES H. JUDD,
Secretary.

DISCUSSION AND CORRESPONDENCE.

DR. WILSON ON PREHISTORIC ANTHROPOLOGY.

IN SCIENCE October 27th and November 3d, last, Dr. Thomas Wilson has committed several errors which if not corrected are calculated seriously to mislead one not familiar with the subject. The position he occupies as an officer in the United States National Museum of itself gives weight to any paper he may publish, added to which he calls special attention to his travels in Europe and his thorough familiarity with the museums and individuals who believe in a paleolithic period, his acquaintance with the Dordogne, and his many years in the National Museum, all of which he asserts peculiarly fits him to form a valuable opinion in any comparison of American with European Implements. As in at least one paragraph Dr. Wilson has assailed certain assertions of the writer and has referred to the same by misquoting what has been written, opportunity should be taken to show his errors if such exist.

His subject is Paleolithic man in Europe, and America, and his existence through eons of time, only measureable by geologic periods; through all of which man chipped stone and did not know the art of grinding it; or as Dr. Wilson contends, of sawing or drilling stone, of making pottery, or of the use of the bow and arrow; that paleolithic implements are in a class by themselves. Dr. Wilson goes further than do the European archæologists; he adopts their classification and holds up a danger flag to Americans who would deny the existence of evidence of a paleolithic period in America. The writer's denial that European classification is based on sound scientific reasoning he strenuously combats.

Dr. Wilson is one of ten or a dozen members of the Anthropological staff of the United States National Museum, and though the majority of that staff have had equally as good opportunity to study the American branch of the subject, and several of them far better than he, he stands alone in his views. He takes exception to the writer's opinion that the art of chipping stone, technically considered, is more difficult than is pecking and grinding. Yet all experience as well as all implements employed by savage races wherever found, show that the tools used in chipping are complicated, whereas a simple discoidal hammer constitutes the sole implement employed in pecking and battering stone and is found in all countries throughout all periods. No one has suggested the reversal of the paleolithic and neolithic periods for the simple reason that such classification is illogical, it would argue the absence of man during the whole paleolithic period from the areas of metamorphic stone on the continent as such stone does not chip. All experience teaches that man of the stone age wherever found was thoroughly acquainted with the artificial fracture of the available material of his vicinity whether for chipping flint, for battering diorite or kindred stones, or for hammering copper which to him was but a malleable stone. In chipping flint and similar stones, the artificial fracture varies enormously, even in the same ledge, and consequently is treated invariably in the way best suited to its peculiar texture. The present classification of stone age periods has become bewildering chiefly because of its many divisions and subdivisions. Many of these are very useful and suggestive especially that of Thomsen of Denmark who divided the human periods into Stone, Bronze and Iron, but when we read Paleolithic, Neolithic, Prehistoric, Copper, Eolithic, Upper and Lower Tertiary, the same of Quarternary, Mesolithic, Acquitanean, Sortorian, several classes of Lacustrian and a host of Cave periods, named from animals present, or from the type of stone implements found, it must be admitted the series become difficult to remember. This list is but partial and if it were necessary could be greatly increased, but, however useful for local purposes or for a single country, it will not answer for general stone age conditions. Adrien de Mortillet made a most valuable contribution

when he formulated a classification according to the function of the implement, as by pressure, friction, etc. De Mortillet's classification was elaborated by Holmes. The present writer classified human periods and conditions by showing that nature in its stone, bone, shell, and vegetable products furnished practically all primitive material, with which man could perform such labor as conditions required, as to cut, crush, color, pierce, bind, contain, etc., as knives, hammers, paints, thorns, thongs, vessels and similar primitive implements, which in combination with one or other material became special and in time complex tools, and eventually machines, as human culture increased. In this no effort was made to reverse accepted classification, but an effort was made to show that to insist upon it could only lead to inextricable confusion.

European archæologists deny the finding of ground tools in quaternary strata, and account for their alleged presence by asserting the intrusion through water, by the burrowing of animals, or by the want of scientific training of their discoverers; but the chief objection is that because ground they must be neolithic. In areas where only non-chippable stone is found it is argued that this constitutes evidence that paleolithic man never was there present. If only chipped stones are found, the argument is made that that of itself is proof of the presence of paleolithic man only. The specimens of river drift implements in American museums are quite commonly wastrels, due to the presence of knots or refractory spots in the stone, and can not be improved upon by the most skillful manipulation.

The Mousterian specimens found at La Madelaine, though commonly considered as being rudely chipped, owing to their being worked on one side only, resemble greatly the yet ruder chipped obsidian objects from Easter Island, which if struck upon the opposite side to that from which chipped, are destroyed by fracturing along lines of lamination or natural cleavage. This inferior texture has led many to suppose the American Indian to have been an inferior stone worker, though the contrary is proved by many specimens of obsidian, jasper and chalcedony from the west and southwest. Notwithstanding the rude chipping of the cave of La Madelaine, it was inhabited by people who were skillful artists in the working and etching of bone, antler and ivory compared by any standard. In this cave and in that of La Bicheaux-Roches near Spy in Belgium, and elsewhere, there have been found at the very bottom, with the oldest of the extinct cave fauna, elaborately carved and bored antlers commonly called Batos-de-Commandement, bone pins with eyes and without, toggles, and other objects of known and unknown use, skillfully made from bone, antler and ivory. This ivory, antler and bone is much more difficult to grind, saw or smooth than is the average neolith, yet is sawed, ground, smoothed and bored notwithstanding.

Dr. Wilson himself refers to bored or drilled teeth among the tertiary remains presented by L'abbé Bourgeois. Near the bottom of the cave at Spy were found plates of ivory representing seals, ground ochre in a hollow bone, and three pieces of burned pottery. In Belgium, in Wurtemberg, in France, in Baden, many of the most distinguished archæologists have recorded the finding of pottery repeatedly.

The existence of plateau man, either in England or France before the present rivers began to form valleys, has but little evidence to support it.

Similarity of implements in widely separate parts of the earth is accounted for by similarity of man's needs, and the natural supply of most regions furnishing objects to pierce, cut, hack, or pound with or even to supply covering, in the abundance of shells, stones, trees and animals to furnish the great essentials of human life. And this similarity of man's tools appears to be due more to his efforts to imitate nature and its products, than to any inter-communication of races or nations carrying their trades from continent to continent throughout all times, and can not be designated as materialism. The suggestion of two invasions of America from Europe, one corresponding to the chipped, and the other to the ground stone area, will find few supporters.

Dr. Wilson's belief in man of the Trenton gravel and elsewhere in America belonging to the paleolithic period has its supporters, though

the fact that one of the most expert of the assistants of the Bureau of American Ethnology spent a whole season in the great ditch dug through this gravel without finding a single specimen, is a powerful argument in favor of the contention of Holmes and McGee that those found are from the talus or within a few feet of the surface.

The finding of pottery, arrow and lance heads, and axes with Koch's mastodon in Missouri can not be said to be a scientific argument in support of a paleolithic period during which Dr. Wilson asserts man did not possess three of the four objects enumerated, it appears equally true that the drilled objects of Bourgeois hardly strengthens the theory of tertiary man if we follow correctly the argument.

European drilling, all things considered, appears to have been accomplished with better tools than were those of America, and the holes were commonly larger and drilled through harder stone than were those drilled in America. We can not expect to find any of the remains of man in the gravel of the drift which has usually ground to powder all other stones softer than flint, and the Calaveras skull alleged to be found in the auriferous gravel could hardly have survived; even the pestles and mortars found with it were like those of to-day and the skull is said not to present the appearance of a fossil.

J. D. McGUIRE.

ELLICOTT CITY, MARYLAND.

A NATURALIST'S DIRECTORY.

A BOOK which recently came to this library was called to the author's attention a few days' ago. The book is entitled 'The Naturalist's Directory' and is published by L. Upcott Gill, London, 1899. In the preface it is stated that the object and purpose of the book has been so enlarged as to include all naturalists, especially of Great Britain, and we were lead to believe by this preface that the book might be of value as a directory to naturalists in general. When, however, we turned to the lists of naturalists outside of Great Britain, we were at once impressed with the incompleteness of the work, and this incompleteness is especially noticeable in the case of the United States.

Under the general head of zoology, which includes entomology and mere collectors, as well as scientific zoologists, only thirty-three names are mentioned as pursuing this line of work in the United States. Of these names only eight or ten are of men who are at all well known. In the subjects of Microscopy and Botany, we were astounded to find that only three men in the United States were pursuing these branches of science. Of these names two are well known. According to the lists of workers in geology and paleontology, we find that the United States can boast of six men to grace these professions. Besides these interesting discoveries, we notice that there is one gentleman in the United States who is interested in Indian relics, and one other gentleman who is making a study of anthropology.

It would seem as if even in such a far away town as London, more complete information might be obtained concerning the status of scientific work in this country.

E. V. WILCOX,

U. S. DEP'T OF AGRICULTURE.

DR. G. W. FOSTER AND THE 'LAKESIDE MONTHLY.'

TO THE EDITOR OF SCIENCE:—I have read with much interest, in your issue for November 17th, the sketch of my old friend Dr. J. W. Foster. One statement, however, needs correction: that "he was the editor of the *Lakeside Monthly*." Dr. Foster was for a year or two a frequent and valued contributor to the *Lakeside*, but was at no time its editor.

FRANCIS F. BROWNE.

BOTANICAL NOTES.

THE WILT DISEASE OF COTTON, WATERMELON AND COWPEA.

A FEW days ago Dr. Erwin F. Smith, of the Division of Vegetable Physiology and Pathology of the United States Department of Agriculture, issued an important contribution to our knowledge of the fungi which produce plant diseases. After about five years of investigation enough facts are known to warrant the publication in a pamphlet of seventy-two pages of what the author calls a condensed account of the disease, and the fungus which causes it. The gross symptoms of the disease in the water-

melon "are those of a plant transpiring freely, and insufficiently supplied with water, although at the same time there is an abundance of water in the soil." This condition is brought about by the clogging of the vessels of the plant by the threads of an internal fungus parasite, thus checking the current of water which otherwise would supply the transpiration loss. The leaves of the plant sometimes wilt suddenly in large numbers, "so that a healthy-looking vine may lose all of its foliage in twenty-four to forty-eight hours."

The fungus concerned is a Nectria-like plant related to *Nectriella* and *Melanospora*. Its closest relationship is with Rabenhorst's genus *Cosmospora*, from which it differs in its non-septate ascospores. Dr. Smith proposes the name *Neocosmospora* for the genus. Accordingly the scientific name of the fungus is *Neocosmospora vasinfecta* (Atk.) Smith. Ten fine plates (one colored) illustrate the paper.

THE FERTILIZATION OF *Albugo bliti*.

In the September and October numbers of the *Botanical Gazette*, Mr. F. L. Stevens publishes an important paper which adds to our knowledge of the fertilization of the Peronosporeæ. As is well known, these plants are non-septated, branching tubes, containing multitudes of minute nuclei. The behavior of the nucleus is everywhere an interesting phenomenon, and it is especially so in these multinucleate plants. In ordinary plants and animals in the process of fertilization there is a union of two nuclei, *i. e.*, the oösphere, or *egg*, and the sperm, or male nucleus. In the plants studied, the oögone contains about 300 nuclei at the time when it is cut off from the remainder of the fungus thread, and these are materially increased by subsequent mitotic division. By a process of differentiation most of these nuclei come to lie outside of the oösphere, but fifty or so remain within it. The antheridium contains at first about thirty-five nuclei, which increase by mitotic division to four times the original number. On the opening of the antheridial tube the male nuclei fuse with the female nuclei in pairs. The oösphere is, therefore, to be regarded as a compound sexual organ.

THE OTTAWA ARBORETUM.

The Catalogue of the Trees and Shrubs in the Arboretum and Botanical Garden at the Central Experimental Farm, at Ottawa, Canada, prepared by Wm. Saunders and W. T. Macoun, is an interesting contribution to the subject of experimental forestry. It contains a list of the trees and shrubs, 3071 kinds, which have been tested at Ottawa during the past ten years. Of these 1434 have been found to be hardy, 361 half hardy, 232 tender, 307 winter killed, while 737 have not been planted long enough to admit of an opinion as to their hardiness. Among the species reported as hardy, contrary to our expectations, are the following: *Æsculus glabra*, and other species of the genus; *Catalpa bungei* and *C. kæmpferi*, *Castanea dentata*, *Halesia tetraptera*, *Morus alba* and *M. nigra*, *Rhus cotinoides* and *Ginkgo biloba*.

THE SPREAD OF FORESTS IN NORTHEASTERN IOWA.

In an interesting paper on the forest trees of Dubuque county, Iowa, in the forthcoming tenth volume of the Report of the Iowa Geological Survey, Professor Macbride first discusses the forest conditions of the past with narrow belts of trees along the streams and protected bluffs. He then says: "On the advent of civilization, the checking of prairie fires gave the forest here as elsewhere great relief. Young trees came up in every direction, partly from seeds, partly from so-called bench-grubs, old stump-like stocks which had been in the days of prairie fires again and again burned off, only to start again in shoots and suckers with the advent of spring; but destined so long as fires swept over them, never to attain tree-like dimensions. These bench-grubs sometimes were very old and possessed an extensive root system. This accounts in part for the rapidity with which the forests of Iowa began to spread with the arrival of civilized man. In the case before us the early farmers selected, of course, the more level country; the steeper and poorer hills were left to nature and became quickly forested, covered with what is called second-growth, an assemblage of trees denser and darker than ever occur in nature under any other circumstances. In Julien and Peru town-

ships some of these second-growth forests may yet be seen which have been growing at least fifty or sixty years. So that the oft repeated remark as to the number of Iowa trees, to the effect that their number has greatly increased since the country has been settled, is strictly true.''

CONTRIBUTIONS FROM THE NATIONAL HERBARIUM.

THE Division of Botany of the United States Department of Agriculture has issued another of its series of Contributions from the National Herbarium which have done so much to raise it in the estimation of the scientific men of the country. The present bulletin (Vol. V., No. 4) is mainly from the pen of J. N. Rose, and deals mostly with Mexican plants. In his studies of Mexican and Central American plants, the author proposes a rearrangement of the genera of the difficult group Agaveae, illustrating each with one or more wood cuts. Another interesting division of this paper is that on 'Some Mexican species of *Thalictrum*.' Perhaps the most attractive paper in the bulletin is that entitled 'Notes on Useful Plants of Mexico.' This takes up in order the cereals and vegetables, fruits, beverage plants, seasoning and flavoring plants, medicinal plants, soap plants, tanning and dye plants, fiber plants, brush and broom plants, fence and hedge plants, plants, yielding wool, and miscellaneous useful plants. The principal fence plant appears to be the giant cactus bearing the name *Cereus pecten-aboriginum*, which often reaches 15 to 20 metres (45 to 60 feet) in height, and sends up a multitude of long, naked branches. These are cut into lengths of 18 to 20 dm. (5 to 6 feet) and set in rows where they root and form fences of the most impenetrable kind. Several fine photographs of this cactus, reproduced in half tone give one an excellent idea of its appearance. The text and half tone illustrations of fibre plants are equally instructive. One is struck with the ingenuity displayed by the people in utilizing the fibre plants of the country, and at the same time with the primitiveness of the methods employed.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

UNITED STATES GEOLOGICAL SURVEY.

IN forwarding Part II. of the 19th annual report of the U. S. Geological Survey, which we hope to review later, the director, Dr. Chas. T. Wolcott writes:

Of its contents (five papers), the first 'Physiography of the Chattanooga District, in Tennessee, Georgia and Alabama,' by C. W. Hayes, sets forth the results of a study of a region in which several distinct types of land surface are characteristically developed under such conditions that the part taken by the several factors can be fairly well determined; it traces the process of drainage development and the origin of the present land forms upon rocks of diverse erodibility and diverse structure; and, finally, by a concurrent examination of drainage and surface, reviews the recent geologic history of the region.

The second 'Principles and Conditions of the Movements of Ground Waters,' by F. H. King, contends that the water which occupies the interior of the earth's crust, is, like that of the ocean and of the atmosphere, constantly in motion. These motions are at once numerous, extended and very complex, and are brought together and discussed under three categories, gravitational, thermal and capillary.

The third, 'Theoretical Investigation of the Motion of Ground Waters,' by C. S. Slichter, relates to an investigation of the general problem of the flow of water through porous soils of rock.

The fourth is entitled, 'Geology of the Richmond Basin, Virginia,' by N. S. Shaler and J. B. Woodworth. The Richmond area is important from the economic as well as the scientific point of view. It contains the only freely burnable coal lying immediately adjacent to tide water in the eastern portion of the United States. The quantity and quality of this fuel appear sufficient to give it a value in the industrial arts.

The final paper, 'The Cretaceous Formation of the Black Hills as indicated by the Fossil Plants,' by L. F. Ward, with the collaboration of W. P. Jenny, W. M. Fontaine and F. H. Knowlton, presents a brief historical review of the investigations of earlier explorers, followed by specific chapters on the Minnekahta, Blackhawk

and Hay Creek regions, general observations on the Cretaceous flora, fossil cycadean trunks, fossil forests, lower Cretaceous plants other than cycadean trunks and silicified wood, and the flora of the Dakota group proper.

PROFESSOR VIRCHOW'S JUBILEE.

THE Berlin correspondent of the *British Medical Journal* writes: It was to be expected that Rudolf Virchow's Jubilee—the 50th anniversary of his tenure of office as Professor Ordinarius—would not be passed over in silence by the University of which he is, perhaps, the most illustrious member. No banquet or similar social function took place, it is true; nor was there any array of State delegates or representatives of foreign universities. In the hall of the Pathological Museum (Virchow's own creation) the Senate of the University, its Rector, Professor Fuchs, at their head, assembled to greet their revered and honored colleague, and to present an illuminated and illustrated address, the text of which had been written by Professer Waldeyer. In it Virchow's wonderful many-sidedness, and his achievements as scientist, archæologist, and politician were recounted in glowing terms. "We all know, however," the address went on to say, "that the roots of your strength lie in your work as a German Professor, and ever the 'Professor' has been foremost with you. We know that, even in your 78th year when the day's work is done, the night hours are devoted by you to scientific research * * * Thus we see you to-day in our midst, the Professor Ordinarius of five decades, active among the most active, beloved, honored and admired by thousands of pupils, colleagues, and men of all orders in every part of the world. In honoring you, who in your long, laborious life have ever had at heart the honor and weal of the German universities, and above all of the Alma Mater, Friederica Guilelma Berolinensis, we honor ourselves. May your strength be long preserved to us!" Virchow, who was surrounded by his family and many personal friends, in his reply gave expression to his thanks for the support which he had always met with on the part of the university, and said it was true that his chief feeling had ever been that of 'the Professor.' In cases of conflicting interests he had always chosen the course of 'Professor.' He said that, like others of his age, he was sometimes conscious of a certain isolation, many friends and fellow-workers having gradually fallen out of the ranks. But the best results of his work had always been due to the independent efforts of his pupils, and he had the firm hope that the pathological school of Berlin would retain its distinguished position. In the evening the Berlin Medical Society did homage to its President (Virchow) by a graceful little spontaneous ceremony. The Presidential chair was wreathed and decorated with flowers and garlands, and the Vice-President, Professor v. Bergmann, greeted Virchow with a speech full of hearty good feeling, respect and admiration. Virchow seemed sincerely touched, and expressed his thanks in a short speech. Subsequently, he took a prominent part in the evening's debate on Organo-therapeutics, thus proving mental unimpaired activity even at the end of a day of ovations and congratulatory speeches.

SCIENTIFIC NOTES AND NEWS.

THERE will be a meeting of the general committee of the American Association for the Advancement of Science at Yale University, New Haven, Conn., on December 28th at 4:30 p. m. It will be the sad duty of the committee to elect a president to fill the vacancy caused by the death of Professor Edward Orton. Immediately following the meeting of the committee a meeting of the Council will be held to consider the general business of the Association.

THE desirability of forming a western branch of the American Society of Naturalists, with the same objects and conditions of membership as the main society, has long been under consideration by the naturalists of the Central and Western States. For the purpose of starting such a branch, if it seems, on discussion, desirable (the main Society acquiescing), a call has been issued for a meeting of members of the American Society of Naturalists and affiliated scientific societies living west of the Alleghanies and of others interested in providing for an annual meeting of the western naturalists; the

present meeting to be held at the Hull Biological Laboratories, University of Chicago, Thursday and Friday, December 28 and 29, 1899.

The provisional programme is as follows: *Thursday:* 10 A. M.—General meeting in Botany Building, for organization and reading of papers. 3 P. M., Discussion: Methods and Results of Limnological Work. 6:30 P. M., Dinner at the Quadrangle Club. *Friday:* 9:00 A. M.—General meeting for reading of papers.

Naturalists are requested to send titles of papers to C. B. Davenport, 5725 Monroe Avenue, Chicago.

The committee in charge of the arrangements consists of Professors C. R. Barnes, H. H. Donaldson, S. A. Forbes, Wm. A. Locy and Jacob Reighard.

PROFESSOR S. W. STRATTON, of the University of Chicago, has recently been appointed Inspector of Standards, Bureau of Weights and Measures, in the corps of which the Superintendent of the United States Coast and Geodetic Survey is the official head. In accepting this position Professor Stratton takes immediate charge of the United States Office of Weights and Measures at a most opportune time. This Office has long had in its custody the national standards of length and mass and has done much valuable work for science and the arts, which has been the logical outcome of this custody. Within the last two years the Office has taken up vigorously the matter of standards for electrical measurements, has acquired apparatus and made special studies, and is now ready to do valuable work along that line. It is especially well supplied for measurements of resistance of the highest degree of accuracy. Aside from this departure from the traditional policy of the Office there is a strong, well-founded and steadily-growing demand for a radical extension of the scope of the Office, which will doubtless be answered in the affirmative in the near future under the leadership of Professor Stratton.

THE deputation which was appointed to visit the United States and Canada with the view of inquiring into the working of some of the leading universities returned to Birmingham on December 7th. When Mr. Andrew Carnegie made his donation of £50,000, he suggested that some of the features of the American universities should be incorporated in the proposed Birmingham University, and Mr. G. H. Kenrick, Professor Poynting, Professor of Physics, and Professor Burstall, Professor of Engineering at Mason University, were deputed to make the necessary inquiries. They left Birmingham on November 1st, and visited Cornell University, the Massachusetts Institute of Technology, McGill University, and the leading colleges and schools in Chicago, Baltimore and Philadelphia, concluding their tour at New York. The deputation will present a report to the University Committee embodying their views.

DR. YERSIN, well known for his researches on the plague, has been charged by the Government of Cochin China with a special mission to Java.

PROFESSOR JOSIAH ROYCE goes to Europe again this Christmas to complete his course of Gifford lectures at the University of Aberdeen.

Dr. HERBERT M. RICHARDS, instructor in botany at Barnard College, has unfortunately been compelled by ill health to relinquish his courses and has sailed for Europe.

PROFESSOR HELMERT, director of the Geodetic Institute of Berlin, has been elected a member of the Royal Astronomical Society of London.

PROFESSOR JOHN M. COULTER, who is spending his vacation at Washington, will shortly publish *Plant Structures*, a book for secondary schools and colleges, this following his other recent publication, entitled *Plant Relations*. Professor Coulter has just completed *Synopsis of Mexican and Central American Umbelliferae*, now in the hands of the government printer. He expects a revision of *North American Umbelliferae*, a large volume, to be published by the Smithsonian Institution. Before he returns to the university in April, Professor Coulter expects to publish *Special Morphology of the Seed Plants*, a university text-book upon which he has been working for a number of years.

Dr. T. E. Thorpe has been appointed to succeed the late Sir Edward Frankland in the work of analyzing the water supplied by the London water companies. Dr. Thorpe is Principal of the Laboratory Department in connection with the Inland Revenue Offices, and was formerly Professor of Chemistry of the Royal College of Science of South Kensington.

Frederik Mauritz van der Wulp, the celebrated Dutch dipterologist, has died at the age of 80 years.

The death is announced of Frau Anna von Helmholtz, the widow of the late Hermann von Helmholtz.

A cablegram to the New York *Herald* from Lima, Peru, reports that Professor Miguel Fort, of the Lima School of Mines, lectured on December 3d before a large audience on the discoveries made during his recent visit to Cerro de Pasco. He brought forward evidence of the existence in Cerro de Pasco of rich deposits of gold, silver and copper.

During the past summer the University Geological Survey of Kansas made extended examinations in the lead and zinc mining district in the vicinity of Galena, preparatory to issuing a full report on the subject. Professor Haworth and five assistants from the State University spent the entire summer in the field, and were successful in gathering a large amount of data, much of which will be entirely new to the mining world.

It is announced that the plague has appeared at Lourenco Marques, the Port of Delagoa Bay. The spread of the disease among the armies in South Africa is thus rendered possible. The plague is now also reported from Algeria. The deaths in India still amount to about 5000 a week.

A museum for children to illustrate the sciences has been opened in Bedford Park, by the Brooklyn Institute. It contains exhibits in botany, mineralogy, geology and zoology.

Dr. G. A. Dorsey, curator of anthropology, Field Columbian Museum, accompanied by an assistant and the Rev. H. R. Voth, left Chicago December 6th for the Pueblo of Oraibi, Arizona. The aim of the expedition is to secure additional ethnological material, to witness the approaching solstice ceremony in order to get suggestions for new groups, and also to start a systematic and somewhat extended excavation in order to strengthen the archæological exhibit from this interesting region. The expenses are covered by Mr. Stanley R. McCormick, of Chicago, who has placed $5000 at the disposal of the Museum in addition to the $10,000 already expended on the Hopis. The splendid exhibit filling three large halls is drawing crowds of visitors and attracting wide attention.

Mr. George Byron Gorden started for Central America, December 5th, on an archæological expedition under the auspices of the Peabody Museum of Harvard University. It is hoped that an arrangement may be made by which explorations can be renewed at the ruins of Copan, where the museum has done such important work during previous years.

Archæological explorations have been carried on, along the Sound and lower Hudson Valley during the past season, by Mr. M. Raymond Harrington, son of Professor Mark Harrington. These have been for the American Museum of Natural History and have brought to light a number of Indian burials as well as specimens from the shell-heaps.

Captain Desy has returned to London after two years spent in exploring in Central Asia more especially the unknown parts of the Yarkand River.

The Goldsmith's Company has made a further grant of £1,000 to the Royal Institution of Great Britain, for the continuation and development of original research, and especially for the prosecution of further investigations of the properties of matter at temperatures approaching that of the absolute zero of temperature.

Lady Prestwich, widow of Sir Joseph Prestwich, has bequeathed £500 for the public museum at Forres.

A commercial museum is planned for Berlin under government auspices. Branches may be established at Hamburg and Stuttgart.

An Industrial Museum is soon to be established in the City of Mexico under the auspices of the Government. The museum will occupy the old church edifice of Betlemitas, on San

Andres Street. It will contain extensive exhibits of the mineral, agricultural and manufacturing products of Mexico.

THE fourth annual meeting of the New York State Science Teachers' Association will be held at Syracuse, N. Y., on December 28th and 29th. A varied and interesting program is promised. The address by the President Professor LeRoy C. Cooley, of Vassar College, will be given on Thursday evening. The subject for discussion for the first morning is the sequence of the sciences in the secondary school curriculum, opened by Principal T. B. Stowell of the Potsdam Normal School. On Thursday afternoon sub-committees will report on the teaching of zoology and of chemistry in the secondary schools. On Friday morning the subjects to be taken up are 'Earth Science in the Secondary Schools,' by W. H. Snyder, Worcester Academy; 'College Entrance Requirements in Science,' Dean W. H. Crashaw, Colgate University; and 'The Training of Science Teachers for the Secondary Schools,' Professor Edward L. Nichols, Cornell University. On Friday afternoon the equipment of laboratories and the management of laboratory classes will be discussed with separate sections for the biological, physical and earth sciences. Several committees will report at the final session on Friday afternoon.

THE Physics Club of New York, which is composed of teachers of physics in the secondary schools of the city, held its fifth meeting at the physical laboratory of Columbia University on Dec. 16th.

Natural Science gives the following particulars in regard to Mr. E. R. Waite's trawling and dredging cruise under the control of Mr. F. Farnell. The cruise, or rather series of four cruises, lasted from February 18th to April 9th. The coast-line covered extended from Jervis Bay to the Manning River, and except for a trip to Lord Howe Island, the greatest distance from land was 25 miles. The depth at which the trawl was lowered ranged between 10 and 90 fathoms. The fishes were the chief objects of study; about 100 species, represented by 365 specimens were collected, and Mr. Waite's preliminary 'Scientific Report on the Fishes' was published last year as an appendix to Mr. Farnell's 'Report upon Trawling Operations.' Several species are new to the colony, while a a few are new to science. The entire scientific collections have been deposited in the Museum, and the results will be published as a Museum Memoir, towards the expense of which £400 was voted. On the last cruise to Lord Howe Island heavy weather was encountered, and the passage occupied seventy hours instead of the usual thirty-six. Mr. Waite and Mr. Ethdridge, who also was on this trip, were left on the island for eleven days, since the *Thetis* was blown to sea in the gale. They collected here some additional very interesting remains of *Meiolania platyceps*, the peculiar extinct chelonian, which is also found in Patagonia. Also by the help of Mrs. T. Nicholls they obtained an additional collection of shells. A large number of sponges, anemones, corals, gorgonias, echinoderms, crustaceans and polyzoa were collected during the cruise. The number of species was very great, and included many new or hitherto unrecorded from the coast of New South Wales.

THE *British Medical Journal* states that at a meeting of the delegates 'degli ordini medici' attending from all parts of Italy, held on October 24th, under the presidency of Professor Durante, it was resolved to send a deputation to the Prime Minister (General Pelloux) to ask him to bring in a bill withdrawing the right to practice, even among their countrymen, from all foreign medical men (not holding Italian degrees), whose own country did not grant Italian graduates reciprocal rights of practice. General Pelloux informed a deputation next day that he would introduce such a bill immediately on the opening of the Italian Parliament, which has been summoned to meet on November 14th.

UNIVERSITY AND EDUCATIONAL NEWS.

MRS. J. H. CHAPIN has endowed the chair of mineralogy and geology at St. Lawrence University, Canton, N. Y., with $30,000. This chair was occupied at the time of his death by the late Dr. J. S. Chapin.

EX-MAYOR CHESTER WARD KINSLEY, of

Cambridge, Mass., has given $25,000 to Brown University.

THE sum of $10,000 has been given to McGill University for the establishment of a research scholarship in electrical engineering.

WE are glad to learn that the suit entered to break the will of the late Professor Marsh, of Yale University, has failed and that the will leaving his property to Yale University has been probated.

COLUMBIA UNIVERSITY will for the first time hold a summer session this year. The courses will open on July 5th and will continue until August 8th. Each course will be given daily including Saturdays and will entitle students to credit toward College and University degrees. The courses offered are as follows: botany 2; education, 5; English, 5; geography, 2; manual training, 2; physical training, 2; mathematics, 3; philosophy, 1; physics, 2; psychology, 2.

IT is expected that the statutory committee will complete the formulation of the statutes for the University of London before the close of the present year and that they may be adopted by Parliament before Easter. It is hoped that the reconstituted University of London will be established at the Imperial Institute before the beginning of the summer holidays.

PROFESSOR WINSLOW UPTON, professor of astronomy of Brown University, has been appointed dean of the college.

MR. GRAFTON ELLIOT SMITH, B.A., of St. John's College, Cambridge University, has been appointed demonstrator of anatomy.

THE Degree Committee of the Special Board for Physics and Chemistry, of Cambridge University, are of opinion that the work submitted by Walter Rosenhain, of St. John's College, advanced student, comprising the following papers: (1) Experiments on Steam-jets; (2) On the Crystalline Structure of Metals (Bakerian Lecture, 1899, by Professor Ewing and W. Rosenhain); (3) Experiments in Micro-metallurgy (by the same two authors as No. 2)—is of distinction as a record of original research.

PRESIDENT JAMES B. ANGELL, of the University of Michigan, concluded his annual report by expressing "gratitude for the considerate treatment accorded us by the Legislature at its session last winter. Almost unanimously it raised the appropriation for our aid from the tax of one-sixth of a mill to that of one-fourth of a mill. It thus increased our annual income by about $92,500. This addition to our resources was imperatively needed to keep the University in the position it had so long held among the strong universities of the land. With our great number of students we were in sore need of some new and commodious buildings and also of additions to our faculties. The institution has been maintained with the utmost economy, at an expense not exceeding one-half or two-thirds of that of even smaller universities. The hearty support given us by the Legislature furnishes us the gratifying evidence that the commonwealth which we are striving to serve believes that we are really conferring substantial benefits upon her and upon the nation. That is our sufficient reward and the stimulus to renewed energy in the future."

THE mathematical tripos and the senior wrangler appear to be such an essential part of Cambridge University, that many will be surprised to learn that the special board for mathematics has recommended radical changes. The defects of the present system, as stated by the board, are as follows: (1) The range of subjects in Part I. is excessive, and the result is that many are able to prepare only a portion of the subjects contained in the schedule. (2) The papers are made difficult so as to provide full opportunities for discriminating between the best candidates; they consequently tend to become unsuitable as a real test for many of the others. (3) The better students spend three years in acquiring an analytical facility in solving complicated and artificial questions in a great variety of comparatively elementary subjects—in fact, in mathematical gymnastics. (4) The candidates are not brought into contact with the ideas and methods characteristic of modern advances in mathematics. The Board proposes that the first part of the tripos be arranged so that it shall be taken at the end of the second year and that the order of merit be abolished.